

NATIONAL AIRCRAFT SHOW NUMBER

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Managing Editor

CHARLES W. GALE
Assistant Editor

R. PAUL JENNINGS
Assistant Editor

EDWARD KRAL
Editorial Editor

DAVID J. LANE
Art Director

CHARLES F. MORTIMER
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The Oldest American Aeronautical Magazine

EDWARD F. WATSON, Editor

LETTIE E. SMITH, Publishing Director

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—just turn the page top to bottom and look at the photograph on left. Note the normal flying position maintained. The unexpected reduced bodily ease of the man in the pilot's seat. And yet he is head down! Such a feat has not before been possible. It comes to you in the new

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CAPTAIN LEWIS MANCEY FLYING MIMO CASTLE IN CHAMPION AUTOGIRO ON RECENT VISIT TO CUBA (FROM WASH.)

A new era of Autogiro progress - - -



PUBLIC interest in the Autogiro has been so great that an unprecedented amount of publicity is given to the spectacular things it does.

Overshadowed in the news is the everyday, routine, practical operation of Autogiros. During the last year, use of the Autogiro by some owners has become almost as commonplace as the use of their automobiles.

One owner tells us that in four months his Autogiro has made two thousand, three hundred and twenty-eight flights. In fifty-four flying days, it visited eighty-

nine cities and towns, and carried 1,978 passengers.

Another owns two Autogiros. One of these in five months has been flown about four hundred and fifty hours, visiting "practically every city of any size" in ten states.

A third owner reports over five hundred hours of flight, covering thirty-two states, carrying 1,000 passengers.

Total flight records show that Autogiros flew over half a million miles in 1931.

The great amount of daily Autogiro use about which the public hears little is even more convincing than the more spectacular flights of which it hears so much.

The Autogiro Company of America is an engineering and licensing organization. It owns and controls exclusively all Autogiro patent rights in the United States. Merely using compressed high standing will be licensed to build Autogiros with the full cooperation of our engineering staff. Personal licenses are: Bill. Autogiro Company, Ft. Lee, Mich. — Robert. Autogiro Corp., Philadelphia, Pa. Patented Autogiro, Inc., Wilkes-Barre, Pa. E. W. State Company, Inc. Building, White Plains, N. Y. Also in production.

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TRANSPORT AIRPLANE



The PILGRIM 100-A, ten place transport airplane is a complete transport unit, ready for immediate service and fully equipped with two-way radio telephone, and radio beacon receiver... full sight flying equipment... toilet and lavatory... heating and ventilating system... 47 cubic foot mail compartment... 23 cubic feet of baggage compartments... all incorporated into the design and built in at the factory for greatest satisfaction.

The many advantages offered by these up-to-date developments are fully described in illustrated folders which will be sent upon request.

The PILGRIM Airplane and RANGER Engines will be displayed at the National Aircraft Show in Detroit, April 2nd to 10th.

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BELLANCA 1932 TRANSPORT PLANES

THE Bellanca planes on exhibition at the National Aircraft Show in Detroit are further evidence that Bellanca engineers understand the problems of today's transport business.

The new Airbus and Skyracer models at the Show are fast planes! Their speeds are higher than the requirements of the airline operator of sound judgment. Airline executives express complete satisfaction with Bellanca planes for speed operations. These men are influenced, as well, however, by the many other factors that stand back of the Bellanca reputation.

There are such considerations, for example, as reliability and safety. The economy, unobstructed efficiency of Bellanca planes—their structural soundness—and their new features of serviceability—all enter into the economy with which they are invariably operated. Bellanca economy goes farther than first meets the eye; it carries right through the life of the plane, a factor of prime importance to the airline of today.

THE AIRBUS TRANSPORT

Twelve place transport (split main-passenger seating).

Wings of fabric, variable.

Seats genuine leather, dark green, removable and easily cleaned.

Windows close and lower.

Cabin aluminum and air speed indicator visible to passengers.

Rich deep hardwood floor, variable.

Complete radio facilities.

THE SKYRACER TRANSPORT

Six place cabin.

Upholstered in fabric, variable.

Large baggage compartment, accommodating built-in well as weight loaded for radio.

Light flying equipment.

This plane is in every sense a reliable high-speed transport.

• ALL BELLANCA AIRPLANES ARE EQUIPPED WITH ELECTRIC STARTER AND FULL COMPLEMENT OF INSTRUMENTS

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New Castle, Delaware Chrysler Building, New York

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15,000 to 42,000 R.P.M.
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Since P. & W. Performance Records in which PRECISION Bearings participated—Eleven recent Appleton Search, world's altitude record for land planes and airplanes; Best Velocity; etc.—these world's records for altitude and speed with pay loads Pratt and Whitney, most recent—the world's 13th.

P. & W. "Wasp" and "Hornet" Engines have made, and are maintaining, notable performance records—not only in the gruelling tests of daily passenger and transport service, but also in some of the more recent record flights. . . . Norma-Hoffmann PRECISION Bearings, in the superchargers of these engines, have long been an important factor in establishing that dependability for which Pratt and Whitney engines are so well known. . . . At the tremendous speeds above noted, the impeller shaft of the P. & W. Supercharger is carried in PRECISION Bearings—a PRECISION Ball Bearing at the gear end, a PRECISION Ball Bearing at the impeller end, precision affords the needed combination of speed-ability, load-ability and service-ability. . . . Wherever performance must be safe-guarded—in the air, or on land or sea—PRECISION Bearings assure maximum efficiency, maximum life, minimum cost per bearing mile. . . . Let our engineers work with yours. Write for the Catalog.

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To round out the line there are the

Wright "Gipsy" 90 H.P. and the Curtiss "Challenger" 185 H.P.—which established an endurance record of 647 hours of sustained flight.

Chiefs of the Army, the Navy, of Lindbergh, Byrd and Hawley and many other pilots, Wright engines have accomplished more famous flights than all other engines combined. . . Wright engine *power* gives more miles per hour. . . lower operating costs. . . greater reli-

ability and endurance—characteristics which have enabled Wright powered planes to win the National Reliability Tour air endurance prize.



WHIRLWIND 165



WHIRLWIND 240



WHIRLWIND 300-420



GIPSY



CHALLENGER

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AERONAUTICAL CORPORATION
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A DIVISION OF CHRISTIANBURGH CORPORATION
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The Detroit Show in prospect

A glance into the exposition building at the Detroit City Airport before the curtain rises on the Second National Aircraft Show

IN ACCORD with the usual custom, the second display of wares of the aeronautic industry will be held at the Detroit City Airport. At the time of writing there is an excellent probability of filling the world's largest hangar with a group of airplanes, engines, and accessories, whose makers have the future confidently about the most critical period of the history of aviation. The prospects to be displayed represent the results of a long period of research made possible through the recently production part of the past year. Some of them are fundamentally new. Many show important improvements in detail design.

Manufacturing plans

In show management the principal innovation is to be an international model transport line, to be operated jointly by several leading operators over a route of 60 miles in length during the week devoted of the show (from April 2 to 18, inclusive). This route is to be similar to the one operated during the Four Fields Flying Show last year in New York and will comprise a closed circuit of five airports, including the field where the exposition is to be held. The arrangement is to afford a complete circuit trip at a fare of \$5 per passenger, and should provide an additional source of revenue to the show. From visitors coming in from the other airports—Ft. Greese, life Wayne County, and Windsorville in Canada. At least half-hourly service is to be maintained.

Inspired by the excellent decorative work of Arthur J. Barr in the Ford

exhibitions of the two previous years, the show committee, headed in 1933 by Ray Clapper, has retained Mr. Barr in design decorations for the entire show. An exterior setting will be simulated, and all airports guided at the hangar structure considered to represent cranks of trees. The leaves and branches from the trees will form an arch over each aisle. The system effect will be broken only by the structural columns bearing lights and survey masts at the intersections.

An examination of the exhibition plans reveals a definite trend toward specialization. There will be five general display places at the show. None before here the private owner display reflected in completely the needs of their prospective works. Such details as luggage compartments, so often neglected in the pressure of production, have been considered carefully. Desirable seats and cushions are based in many types of planes from the Astoria to the Astoria. The seats are of the Astoria type, and seem to have been selected, except in a few cases, in the folding wing, and that is no doubt due to the unfortunate passengers against this type of machine that have arisen in America. But a return of folding wings in these seats is inevitable when the average engine for the private plane is considered.

Two increasing power output and reduced specific weight are the highlights in the engine exhibit. Incubation of the future trend in engine design is found in the accessory group. Several of these exhibits will contain devices designed in anticipation of even higher

power output than that of the engines introduced this year. Engines to be particularly high power engines are now in the experimental laboratories of leading power-plant producers.

Airplanes

Although airplanes at the show will be fewer in number than in some of the previous expositions, the group will show the results of a more serious consideration of the detailed for various specific classes of machines during the long period of research made possible by reduced production activities throughout the industry. It is expected that the large transport recently completed by the Ford Company will be exhibited at the show. This plane is to be the most, the machine should be one of the outstanding features. This plane is to be carried in detail elsewhere in this issue.

At the other extreme of the range will be several of the smallest light planes, and in the intermediate class will be found private owner designs all better suited to the service for which they are intended than any of their predecessors. At least one of the medium weight transport machines, has been designed especially for transport purposes on the basis of experience gained over a long period of scheduled operations.

A 1200 rated and piston motor engine and six also landing gear of unique design, distinguished the new Astoria airplane, developed by the Aeronautical Corporation of Astoria, and two "Cyclone" models, one with landing gear and the other with floats, will comprise this exhibit. The Astoria

A map of the show layout, program, and a list of exhibitors appears on page 214

Right: The F-16 flying in with the second three under Nelson's command, for two passes and victory flying with a white streak and a lowered main.



Right: Everett Ruess's play, *Allegory*, is being mounted in the U.S. by the same company that produced *Wings*.



Left: World's fastest airplane air-cooled piston plane—the Pietenet Wing P-102 at all-serial engine speed.



Alarms: Invariant points and greater ruler sizes chosen. Includes the Fluoride spurt analysis (200-kg. Stewer). Bell The 118-kg. Whiteland purchased several air space. The store is also available with anyone at 100 lbs. and 200 lbs.

5-111A engine embodies a new head design with improved valve action and is the standard power plant.

The latest model of the *Provacor* with continental engine is to be shown by Amphibious Inc. This machine is a three-phase amphibious, having a hull of unusual design, employing an aluminum alloy bottom and fabric covering for the sides and top with a welded steel tube structure.

The American airplane and Engine Company will show the Pigeon 180A transport plane, described in the November issue of *Aviation* (page 684).

One representative of each of its standard outboard models, the Pacemaker, Skycruiser and Air Bait, will constitute the display of the Billanca Aircraft Corporation. The already high efficiency of the Billanca wing has been increased and the parasite resistance has been decreased, particularly in the Pacemaker and Skycruiser models, through the introduction of a new low drag design of landing gear.

Five models will be displayed by the Red Aircraft Corporation, featuring Kinner, Jacobs and Challenger engines, as well as the Packard diesel. The diesel machine has been designed particularly for aerial service. A conventional open biplane with tandem cockpit arrangement

nent, embodying installation of an automatic pilot control mechanism, as to be introduced to the industry by the Brazil Aircraft Corporation, Brazil, Inc.

Four commercial planes will be shown by the Curtiss-Wright Corporation through its subsidiary, the Curtiss-Wright Aircraft Company. Two of them are of Travel Air type—one a three-place Sperrywing with a 200 hp Whirlwind engine, the other the deluxe Sperrywing with a 300 hp Whirlwind. The "Tuc" jets pushover power.

with the 80-hp Warner engine and a Super Speedwing will be shown.

In a special effort to meet the needs of the non-professional flyer, the Fairchild Aeronaut Corporation has developed a high wing cabin monoplane, with side by side seating arrangement, and ample width of cockpit for such an arrangement. The machine is well proportioned and has exceptionally clean lines. It is designated "Fairchild 24" and powered with the American Cessna inverted engine. An open machine of

AVIATION
April 1955

Heavy Gauge fast rigidity, and excellent stability are features of the Tuffco Continental A-40 Club.

swine drugs designed "22," or actually like that introduced last year is also scheduled for exhibit.

A study of the service requirements of last year's airplanes has been the determining factor in refinement made by the Great Lakes Aircraft Corporation in the Speed Trainer. Larger cockpit opening, redesigned windshields, relocation of baggage compartments, covering redesign for greater engine accessibility, are the most important changes.

Humstead & Huchler, of Detroit, has bought manufacturing rights for the Parks & Ryan Superbiplane and will have a share at the show.

An entirely new contribution to the ultralight market has been made by Mr W. B. Komer. The plane is a strut-braced, low wing monoplane type with a unique one-man folding wing arrangement and sold by sale leasing for the two passengers. Distribution will be direct from the factory, and a rent pay rent plan requiring no insurance has been arranged. The engine is a 100-hp Komer R-5.

The Menascope Corporation will have four of the well-known two-place cabin monoplanes powered by Lambert-Köster, Velle and Warner engines and will display, as a feature of the exhibit, a ton of trophies won by the Menascope plane in various competitions of recent months. Of the new models to be exhibited by the Nicholas Brothers, A-

Stinson Aircraft Corporation will display three models emphasizing the new model R Junior and the Model T Aerliner. The Model R is a 1952 version of the familiar Stinson Junior and the Model "T" is a transport of 32-passengers, complete and latest and most

Improved visibility and general refinements are embodied in the Continental Club, two-place, light plane to be displayed by the Taylor Aircraft Company. The model to be shown is the improved version, described on page 242.

Several of the most basic demands of non-professional owners are fulfilled in the Waco Model A biplace. The machine is available in a Customized Warner Seashak, and three Kneecap models of special importance to the non-professional owner are the one-man convertible winter top and the 120-lb. main luggage compartment ahead of the front seat, which has been provided in addition to the rear compartment.

The sister of the United Aerial & Transport Corporation will include a Harrier Vought Corsair, a Warp Jumbo 5-39 Siftority, and a Warp Jumbo 5-39 Siftority, and a Warp Jumbo 5-39 Siftority. It is possible that the Lord Salomon 2, with which Major James Doolittle was the transcontinental duty during last year's National Air Races will be replaced. The Boeing Parasol Model P-12-E is ranked by the U. S. Army Air Corps as the fastest and most maneuverable aircraft in the world. It is a biplane, very different from the previous P-12 models in that its fuselage is all-metal, monocoque construction. It is equipped with a supercharger. Warp engine of about 500 hp.

Rotating wing mechanisms

That Kalam Aircraft Corporation, making its first appearance at a national show, will exhibit two of the newly introduced airplanes. One of these is the Model K-2, two-place, open, side-by-side machine, powered by a Continental 165-hp. engine while the other is the comparable Model K-3, also a two-place



Abstract: Baggins space is provided in sufficient capacity by the Mass Model 3. A cost-effective machine is also a feature. Left: a computer using space, the first of several in the series.

side by side design but with reasonable cabin enclosure. An improved relationship between rotor and fixed wing and their setting with respect to each other as well as higher propeller efficiency obtained through blade selection are factors contributing to the overall efficiency of the machine. Greater gross weight, relocation of tail surfaces for more sensitive control, and a rebraked mounted power plant are also among the many improvements.

Pittman Aircraft will display the latest sport autogas. This autogas, similar to the PAA-2 introduced last year at Detroit, but considerably improved in appearance, performance, and design. The principal features are increased power and greater cruise area. A radial engine, 300-hp. Klemm, has replaced the six-cylinder, vertical

A rotating wing aircraft essentially different in principle, rotor construction, and operation will be introduced by the Pennsylvania Aircraft Syndicate. It embodies a freeroating rubber-tie air articulated blade attachment.

Discussion

An outstanding series of inverted in-line six-cylinder engines will be introduced by the American Airflow & Ranger Corporation. This group includes engines in a wide power range, all based on the same cylinder design and with interchangeability in accessories. A feature of the exhibit will be the twelve-cylinder inverted V series of V-770 and V-785G models, which are not, respectively, direct drive, direct valve and geared and supercharged versions of the Ranger engine. These power plants develop 220 hp at 2,350 and 240 hp at 2,350 and 2,400 rpm and 340 hp at 1,700 rpm, respectively.

Through the medium of increased sales the Continental Black Stone

The industry's executives classify their problems

Keystones of policy for 1932



William B. Mayo

Air transport faces a new era

By William B. Mayo
Chief Engineer, Ford Motor Company

AMERICAN air transport faces last year's carried its first passengers as in 1920. The volume of mail was just as great. This was the first of steadily reduced traffic on the railroads and other passenger carriers. Such an accomplishment means something.

Measured by the general outlook of business in the past year, it might have been expected that the air transport industry would have shown a decrease in traffic. At the present time of travel, we might have expected it would have been less than last year.

But that was not the case. Instead of falling off, traffic was maintained on a level with the previous year. Distinctly, that is an achievement of which the industry will not be proud. It is fair to assume that if business generally had been normal air travel would have again shown an increase in 1931.

As far as operations were concerned, therefore, the transportation industry made a remarkable showing in 1931. The same was not true of the manufacturing phase of the industry.

The volume of business done by the plane and engine manufacturers last year fell considerably below that of previous years. This was to have been anticipated. Many factors entered into the situation.

One of the most (Continued on page 161)

Aviation progress on aviation profits

By Theodor A. Morgan
President, Eastern-Waiver Corporation

EVERYONE with any knowledge of conditions that exist today in the aeronautical industry must appreciate that when gauged by usual standards it has not been a tremendous success in the past several years. Of course, considerable progress has been made in the general category of development. This includes the development of air transportation, as well as engineering and research development in planes, engines and accessories. Under the circumstances, some outstanding achievements have been accomplished. We have now reached a point in this period of adolescence of the industry that, in my opinion, requires the development of some cooperative effort in development activities, both as technical, as well as the business problems with which we are faced.

Today the industry, both manufacturing and transportation, is dependent almost entirely on the federal government for its present existence and future welfare. The government is currently justified in rendering assistance; but, because it is essential that the United States have adequate air power as a means of defense, it is essential that any



P. G. Johnson

Air travel, on its own record

By P. G. Johnson
President, United Air Lines

ON United Air Lines we issue to every passenger a suggestion card inviting the passenger to record his impressions of the flight and to make suggestions for improvement at the service. From these cards we had one important item to impart the public with the safety of flight.

Thirty-five per cent of the passengers are not only released as frequent riders by the proper observance of safety measures but they become the best witnesses for information regarding the industry here. A check of the suggestion cards reveals that at least 35 per cent of the new passengers we have carried on United Air Lines in the last six months were advised to travel because some passenger had convinced them of the desirability and safety of flight. The single factor for which travel supports the word "No recommendation of a friend" is filed out more frequently than any other check on the card.

By the very fact of the flying on our transport system, at least, in some business men, many of them major executives. They are not the type to fly for the romance of the trip, but they do so because they feel the airplane is safe and is a value. (Continued on page 162)

§ The records indicate from many problems. As an indication to find out how they look and how their rank in relative importance to the men who have to take the lead in solving them, we invited some of the leaders in the field to contribute brief statements for publication in AVIATION. Each of them was asked to select a specific question for discussion, and in no case was a definite subject assigned. In a few instances the shortness of the time and pressure of duties prevented compliance with our requests. § One of the most interesting results of this compilation is the evidence it furnishes of the thought that is being given to the problem of selling the public on the safety of flight. Several of the contributions dwell upon that as the great issue. The discussion of the private market, and the interpretation of the very encouraging record of air transport through the depression period, are also of great interest.



G. M. Bellanca

The public and the safety of flight

By G. M. Bellanca
President, General Aircraft Corporation

AIRCRAFT manufacturers can do almost constructive work in the direction of safety and increased sales by continuing to build safe planes and in increasing their safety in the most direct way—telling the public how safe safe planes are being built, and by stressing the safety of flying at all times. The great step to be taken is to get the government by impetus publication of the airmen's views without accident. The greatest thing before the public at such times will help to show the present status of air transportation, and place the aircraft industry in its true light.

The manufacturer's part is to keep on developing safety through refined design and new safety devices; the main reason is doing this is to keep on improving airplanes, even if they should cost a little more. Instead of making so many different types of airplanes, and especially in many different models of the same type, we ought to concentrate on very few types, more of our present knowledge and skill, and by this concentration reduce the cost of manufacture.

Safety is the first thing we have to demonstrate and prove to the public, and by doing this the public will be more convinced of the soundness of flying. At the present time, the public is almost safety-conscious in regard to aircraft, and it takes just a little more to establish full confidence in flying. However, the fact that the public is so quite as safety-conscious on page 161

What's wrong with the aviation business?

By B. D. DeWitt
Vice President, General Aircraft Corporation

ASIDE from the general trouble-making which practically all industries are suffering, such can be said about the specific ills of our industry and it is certain that economical distribution is the major problem to solve.

"We can save design and build aircraft plants at reasonable prices as there is no such thing as an airplane dealer or distributor, and direct selling is very early."

What is the strong field man, he was asked. "Well, let's break and doesn't show the man who are doing more than they do, not only in teaching people to fly, but also in convincing the general public that travel by air has now become a safe and speedy means of moving planes and getting back and forth to work. He is still waiting for another landing."

Distribution is always the hardest task and we should not be too quick to blame the man who are doing more than they do, not only in teaching people to fly, but also in convincing the general public that travel by air has now become a safe and speedy means of moving planes and getting back and forth to work. He is still waiting for another landing."

Those who have tried that are used to doing it help our only means of distribution? The men who are spreading the hundreds of fields throughout the country are our only means of selling airplanes to the public unless we go into a more expensive industry sales and service. Instead of selling our own planes, we are selling the flying field man. He has had enough flying. His biggest trouble is not in selling his planes, but in getting his gas, oil, or repairs to these owners. He used to make good money on air travel, but his business has fallen off and rates have been cut below cost. His repair business has decreased due to the development of better airplanes and less flying per hour during the past two years. He has been able to sell only a few planes per year, it says, as the per capita consumption was greatly reduced in 1930-31 and he therefore needs capital as well as new technicians to enable him to come back to share in the better times which are just ahead as he has learned through experience that economic times, hard work, economy will. (Continued on page 162)



Theodor A. Morgan

cover airplane is there anywhere that you would pay your own money to buy, or rather how much money you had? Where is the place you would want daughters and wives and sons to learn to fly at? The answer is—Where!

We could make a cheap automobile to sell for a thousand dollars and have bankers and engineers, some cautious, some careless, built up of stacks covered with checks and pencils and tried with good engines and wire controls. This would be very cheap to build but who would be fast enough to buy one? People know quality, they know strength, they know materials and workmanship and they know appearance and so have been building the type of planes that schools had a hard time build and because they did not know it, have said that there was no airplane between.

They respect is the man who has money enough, not only to buy, but to support an airplane.

If he is the man who can judge, or he would not have made this money. He is interested perhaps in seeing planes, or that they consider the his value in money of the equipment, but he is not interested in riding and certainly not interested in buying. If he would buy, it would be in the spirit of the opposition of his wife, who, after all, is the one who is going to see whether John, Public, flies or not. Until we build a plane that the wives like and say, "You can fly, in that and I will go with you," we have nothing to market.

Future needed

Until there is appeal enough in this machine as a vehicle—not as a thrill—by a large public to buy, it will never be law produced.

The only way you will ever get quality and low price is through volume production with complete equipment and standard possible engineering. This provides the use of all gadgets, "flops and slaps" and the elimination of a large amount of improvisation necessary for safety in the old type plane.

Let's consider the woman as our present business idea. Is the one we commonly meet with a very beautiful is the one who buys it and uses it?

The first fundamental of this industry is looks.

The plane must appeal to the eye, not only from the standpoint of beauty and security of line and relations of areas, but from the observation of the mechanical structure which gives it the real safety. Some of the things that need to be done to reduce this feeling are: (a) it should stand as the product harmoniously mixed up at a glance. (b) It should be reminiscent of a positive car or bus. (c) It should have upholstery or trim so that one reminds some previous feeling of transportation security when they sit in the cabin.

Any feature which can be visualized in the design to show how their opinion

line brings greater safety, have an added appeal.

Aside from appearance, the next thing—used it is just as important—to the construction of mass. This is a tremendous job to get rid of the mass of a private plane is close to zero, and to also eliminate any mechanical feeling when one sits in the ship. Nowadays you look forward through the propeller and rocker arms with all coming back on the wind shield and from all appearance seems the riding in the saddle of a machine made cylinder, with a roundish torso.

The machinery

Propellers should be borne in not at all visible, and engine and power plants of engine so that there would be the red feeling of a vehicle and not an airplane. A lot of other things could be done also to make the private owner more interested in the things we want him to buy and fly.

Number one is physical simplicity of control. There is an accent with not being too far from him any security for the use of the rubber in the air, all steering, as well as banking, being accomplished with the fingers. This has been accomplished already in at least one type of plane.

This might even allow the use of a wheel like on an automobile and which would be used the same way, except for its forward action for elevator.

Of course with his arrangement it would be impossible to reduce the plane, but this is not necessary provided complete controllability is a still can be given to enable one to proceed down the considerable height against a long travel also and air wheels arranged on the center of gravity of the vehicle to let it enter the ground like a bird. These things are coming along and can be accomplished within the next year by anyone who really wants to do them. Personally, I believe that the old "bug-bitch" is a step of progress. There is through, no far as private owner is concerned. Which up from on the old type they stand useless anyway as a vehicle of the large single required for the plane to stand on high shifts with proper propeller clearance.

When you put on the third wheel on a car, it is designed to take it, and with the added idea that the lift is taken from all the wings when the front wheel is on the ground, you then have a plane which is designed to rise in the ground at higher than landing speed without danger of its taking off again that adding considerable to the safety of the aircraft when it is first few hours of landing.

Personally, I am convinced that the open type plane has no possibility.

It is a common idea of the private owner to travel around wearing "flops" clothes and land at strange airports to visit his friends all topped out like a circus

clown. The private owner must be able to travel in the same costume and in greater luxury than in his high-class motor car with nothing to disturb him.

The last days of wearing a helmet to show off the superman are over so far as the public is concerned. Let's get over Cockburn we can a bunch of helmets and try and convince somebody that at least some one person in the airplane industry is a business man and not just a pilot or a wooden airplane.

Again, let us remember that military aviation with its very definite and precise—very requirements has absolutely nothing in common with the private-owner vehicle other than engineering. The requirements of the private owner are of an entirely different order than those of air force use. More than that, commercial aviation has long put as many new viewpoints in military aviation and its experience in military has brought in communications and that is a great deal—for which full credit is and should be given.

A hundred a day

There are those, of course, who will disagree with what I say here and say that the airplane is open planes where construction is superlatively are good training planes and can be sold. Of course they can, two or three a day, but will we get a production of a hundred a day we cannot call this an industry in any sense of the word. Where is the day that can sell as quantities of a hundred a day. Nobody has it so far as we know. Nobody has conceived in but it is time somebody worked pretty definitely as it that we may get somewhere with the private owner.

We have been playing around on the edge of business making a "frank aviation service" with "disappointment" and "disappointment" and "big ideas" but we haven't even a beach room paying a dividend.

But after all of this is said—is it not healthy a surprise problem? There is an opportunity for the industry now that it has never had before. The banker with his financial influence is not forcing us to change things that we know will not pay a dividend even if they are perfect as engineering jobs. The banker has gone broke and we don't have to change anything. There is a lot of supposedly critical stockholders.

We have heard it enough lately to create a lot of trouble. We have heard it that it is not a small business more than necessary in many cases by the advertisement of many direct results.

There is the opportunity for new groups, for new engineers, for new inventors—words the customer more and more—not it is just a purveyor of airplanes—who is the customer in the air on foot sitting in the saddle. This is still the problem of the engineer, so let's go to it.

WE ARE
pleased to
have Ar-
auto give
us the opportunity
to answer publicly
questions that are
frequently
asked about the auto-
giro.

We believe that much of the criticism of the autogiro comes from an erroneous point of view. For instance, many of the industry feel that the only criterion of the airplane is how fast it will go and how much weight it will carry for a given horsepower. If this were the case, the autogiro, having the airplane industry would be immeasurably larger than it is today. The autogiro overcomes these limitations, without in the airplane and the qualities in which it is inferior to the airplane at the present time are greatly exaggerated by its comparison with the airplane. Also the autogiro is in the early stages of its development whereas the airplane has already reached the point where it would seem that further improvement can come only from modification and re-

finement of comparatively small details. I would like to analyze here the comparison that are frequently made between the airplane and the autogiro. In the first place, there are very few types of autogiros on the market, but many types of airplanes. We find specific types of airplanes with all kinds of performance, but we do not find a single airplane with the best performance in

Generally new products are likely to be the occasion of a great amount of discussion. Some centers under the head of report of experience, some of pure rumor. The autogiro has been an exception. Since the type came into more or less extended use, it has been carefully watched by the aeronautical world, and it has been the subject of all sorts of stories, criticisms, and changes. We are immensely pleased that Mr. Pittsman and the Autogiro Company of America have elected to use AVIATION as the vehicle for their first public discussion of all these allegations. To make

Payloads, performance, and safety

The autogiro answers its critics

By Harold F. Pittsman

President, Autogiro Company of America



every aspect. The average airplane falls far below the autogiro in speed, although it may meet the requirements of the private owner more adequately. The average airplane was easily left the needs of many than the autogiro which carries the greatest load per hp. Although should be considered from the standpoint of the purpose for which they are built, to even now the autogiro is superior in speed and payload per horsepower to certain airplanes, notwithstanding which, in general, are airplanes.

It would seem that there is excuse what I mean when I use the term "vertical divorce" in answering the questions presented by the editor at AVIATION. A machine which is properly designed will have the center of gravity placed slightly in front of the center of lift. This will at all times create the ability of the pilot to drop the nose of the machine by pushing forward the

rudder that they would be fully covered, the editor of AVIATION drafted a set of questions, making them as pointed as possible. Mr. Pittsman took the questions exactly as written and replied at length to each one, incidentally revealing some hitherto unpublished facts. The questions were drafted by the editor without consultation of the Autogiro Company, and replies were drafted by Mr. Pittsman without consultation of the editor. Without modification is essential content of either one in any of their parts, both questions and answers are reported herewith.

Three phenomena answer the instant importance in connection with welding operations. For these reasons, of necessity, be a close adjunct to the fused area itself, the weld has resolved the problem. The affected area is commonly termed "the crater." Its location and extent can only be determined by macroscopic examination of fused sections. The extended welds appear approximately as grain boundaries and in isolated pockets surface deterioration also appears near the weld, but it is as variable indicator. Since it is seldom practical to reconstitute a welded structure by heating to 2,000 deg., the rate of welding 15-4 is a desirable virtue.

Here it got about as an ability to depend on the material in its state. Economical weld work can do it, and care must be taken to avoid severe bends or limitations of material which has already been solidified. Expertise in design may be given a little strength well over 400,000 lb. per sq. in. but at the expense of common resistance. At 200, 000 lb. stress it is both workable and ductile.

Unfortunately refusal of all the above is necessary for money, nothing to find in structure a guarantee for all material elements, have no need of perfect design—disappointment attributable to expense of these means rather than to shortcomings of the material itself.

Light-Digit is a wonderfully stable alloy which, as stated, and justice every condition of the designer. It requires a special technique, naturally, but the material itself is not a problem. Light-Digit values the effort to use a technique developed for one material in fabricating another. That involved the use of the fine, dust-free, approach, but it was not immediately imitable in the ideal for 15-4. There the process is to form the steel into shape with a melt and down heat treat. Light-Digit values to conform. It cannot be improved by heat-treatment, so physical properties are a function of the rolling in the sheet or wire. Spring makes even the very high elastic limit makes curves formation difficult and a sharp bend is required to set the metal. Consequently, sections are apt to be a series of flats, corners, and bends.

Not to riveting entirely satisfactory.

The metal hardness too fast along the point of extra drilling. Peening is correspondingly difficult. Besides which, any rivet having sharp stress concentration with stress of the plate would be too hard to hold over.

Indicators of spot-welding

Spot welding offers the only accurate and reasonably reliable but less too defect-free must be made in the production of the material. Electric resistance is used to assess that of carbon steel, which is favorable. The surface is clean, which is also important. An air splash from heat all forms does not make for

material adjacent to the weld results between the sides region and the material that has been enough removed to have been fractured, there is a gradual drop from some 3,000 deg. to room temperature. Given facilities, these copper composite areas of material which have cooled from varying temperatures. The danger area is that which has cooled 1,200 to 1,600 deg.

It is readily seen that the time of current application is important. A very long time for a small current would result in complete degradation of heat by conduction and radiation—just as weld. A relative thinner time of application as a weld set loss to

a large heat loss to adjacent material. The shorter the time and the more accurately gauged the current the narrower will be the temperature gradient, as well as the period of cooling. Here, too, correct another factor, namely the period of cooling, for it takes time to precipitate particles, and to change grain structure. A best operation completed in an extremely short time leaves the adjacent material in a healthy state, but if application of the heat is too long permitted and a weld results, it will be like a rivet surrounded by weak material.

Spot-welding

An infinitely short dwell of current is sufficient. That be

switched not over both may be a good low-time construction, but in order, time is an essential factor of heat. Lightning has done some good short-time welding, and spot welding is a more controlled mode of the same. Such explicitly improved high currents have prompted the term *short-welding*, a distinguished term, a brought to trend term spot welding. In that latter the time may or may not be regulated but it may cause a substantial freedom of a second. With any given weld, the apparatus may be adapted to use for minutes and, the best results are to be had from one where transformer and meter are devoted to the specific operation intended, and where the operation is made as largely as possible automatic.

While current and time settings should normally require accuracy, the task, such is undeniably not the case, and the old question is ever present: "Here to I know it is a weld?" A clean crackles enter into the problem; also

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surface, good contacts throughout, electrode pressure, voltage line drop, etc. Surface appearance means nothing, the weld itself often leaving the least indication and vice versa. This is understood, aside when it is realized that fusion actually extends to the outside surfaces. What one sees is an usually localized condition due to good or bad electrical contact.

Furthermore, the note fact that fusion has resulted does not necessarily indicate that a good weld exists. Weld is a phenomenon (from being very brittle to ductile). A weld having a high shear value lacks tenacity and is apt to break, while a weld may be surrounded by a porous weld spall failure by fatigue. A properly made weld of two thin plates of 15-4 will permit of turning one plate welded to another by at least 90 deg. as the weld before the weld shows out of one of the plates, leaving a hole in that one and a pin in the other. The failure never comes as the actual fused material that has flowed across between the plates. As is striking, there is a definite phenomenon occurring: weld quality, size, spacing, and so forth. Suffice it to say that a close-weld in 15-4 should show twice the shear resistance of a rivet of like diameter and of the same material. Weld character is a function of metal thickness and, change to say, is determined by current setting or applied voltage, not at all by the size of the die.



This spot weld under a test of 31,000 lbs. did not break and above the diagram shows the weld was not broken. The weld was not broken. The weld was not broken.

trodes. In airplane work the thickness of the plate used is likely to run from .015 in. to .040 in., and a typical weld is about 1 in. in diameter. The working up of compression strip structure, such as a plate, the welded spots be from 1/2 in. to 1 in. apart. Time and current control also determines the physical character of the weld.

If a single factor be sought for measuring the uniformity of the weld produced by machine, it is best afforded by the record of the heat loss, or waste of energy, dissipated in the flow of the welding current between the electrodes. At this point will have remained a planning philosophy rather than a practice, had it not been for the invention of a "weld recorder" which not only writes on a tape the heat losses entering into

each weld but also gives audible notice of any variation.

The "weld recorder"

The operation of the machine lies only to bring the small into place for each successive weld and depress the treadle which brings the electrodes together against the work and operates the switch and the automatic timer. If the answer all energy flowing through the metal during the welding process falls outside the prescribed limits for an ideal weld, a bell rings to warn the weldman that something is wrong and also to attract the attention of the foreman or supervisor. If the soundings of irregularity become recurrent, it is evident that the controls of the machine require adjustment, or that something is wrong with the material. At the same time a pre-fitted line is drawn on a moving strip of paper for each weld, the length of the line proportional to the energy used. Thus the inspector has a permanent record by reference. The simple steel working on a dial or electrically carried surface a good weldman can make up to 100 welds in a minute.

With this device, not only has the welding been given the reliability of riveting but it is cheaper, simpler, and does not require the use of a welder. Thus the last of a series of developments required in order that stainless steel can assume these structural uses in which it is otherwise so peculiarly useful.

★

The torpedo plane's advantage over the naval bomber

An abstract of an article by Elmer C. Roney, U.S.N.

United States Naval Institute Proceedings

AT THE present time the Navy has not provided types exclusively designed to bombing and torpedo attack, respectively. The two forms of missions are combined in one general heavy duty machine. The author believes that a clear distinction must be drawn between the two types in order to permit comparison between the relative efficiency of each type and to assure full utilization of each one.

As the basis of the naval bombing and torpedo missions available planes have been called upon to perform, he believes the torpedo type holds the greater promise of the two in naval warfare. The bomber obviously would tend to be a larger and slower diving machine than the torpedo plane. Size and consequent weight adversely affect the number of units which may be based on important considerations of any machine designed for carrier duty. The bomber is slower than the torpedo plane, and takes longer to reach its target, since it must attain a certain

high altitude before reaching into the target zone. The torpedo plane, by virtue of the fact that it operates close to the water, need not fly directly toward its target, and by the same token need not be able to make more attacks on a given target in a given amount of time than would its slower, higher flying counterpart. The difference in power makes it much more likely to score a hit.

The author believes, too, that the bomber is more likely to be struck by anti-aircraft fire than is the torpedo plane. The bomber must hold a steady altitude and direction providing the release of bombs in order to take accurate aim. Besides also must fly in a fairly close formation to provide an effective bomb pattern. Both of these restrictions increase the possibility of effective anti-aircraft fire. A torpedo plane, on the other hand, may be maneuvered to disperse enemy range finding practically up to the point of bombing in range, which for a brief period of a few seconds it must be pointed straight at the target.

The general better maneuverability of the torpedo plane is itself much more obvious from definite facts.

The torpedo plane is less affected by adverse weather conditions, such as seas and may operate with the advantage of actually had under across for protection or a certain element of surprise. It can conserve more effectively with surface vessels because of its proximity to the surface.

However, in the light of the above conditions he considers it would be wise policy in the event of war within the next few years to eliminate the heavy bomber from the carrier's operations and concentrate on a strictly torpedo type to greater numbers, at the same time admitting that in case of peace development of bombers should not be limited until the range of effectiveness of the type has been proven.



The final shot welding. In several weeks a machine machine is complete. Cooks are still strong and fit for it from machine to machine.



Above: The first impression of the Ford 14-A is not as much one of size (compare its 110-ft. wing span) as of structural strength.



Above: The carefully balanced bending of the center engine follows the contour of the 110-hp. Hispano-Suiza.



Above: The outward engine, which drives extension struts, are hinged completely while the wing, fixed steel tube engine mounts are hinged between the two main wing spars. The leading gear and struts contain the rubber seals. Left: The Archer tail section are attached to the fuselage frame.



Above: The struts structure parallel full spanform through-out its entire length. Left: The structure of the pilot's weight struts a wing view forward and downward.

The new Model 14-A embodies design features never before attempted in this country

The big Ford transport

IN SPITE of the reluctance of operators to consider the replacement of equipment at present the Ford Motor Company is convinced that the time is not far distant when airplanes of large passenger capacity will be required by the great transcontinental mail lines. As a first step in this direction, the Model 14-A has been designed, and the first machine of this type recently completed.

From its inception the requirements of the transport agencies have been the primary consideration. Not only have questions of passenger comfort and convenience been taken into full account, but, more important still, the problem of economical servicing and maintenance has been given the most careful study. During the design stages, servicing convenience, maintenance shop foreman, and field service men were called in for frequent consultation with the designers. In considering layout the problem was never, where can this or that part be put to get it out of the way?—but rather, how can the parts be so related that any one of them may be fully and constantly available for inspection or adjustment without interfering with other parts, or without disturbing whole sections of the airplane? As has been constantly reiterated in these pages the success or failure of an airplane in transport service may well depend upon the consideration given to the question of maintenance and servicing facilities at the various stages of design.

Outstanding features

Although the airplane measures 110 ft. from wing tip to wing tip, and slightly over 30 ft. from nose to tail, the first impression when approaching it in the open is that of size, but rather of extraordinary clean lines. Except for two small pieces of tie-rod each not over 6 ft. long, connecting the stabilizer with

the fuselage there are no exposed wires of any kind either for landing or control. Refueling points have also been reduced to a minimum. Where they are used, however, they are well streamlined, and careful attention has been given to all points of attachment. Obvious effort has been made to reduce vibration and drag. Convex surfaces are provided where wings meet the fuselage, at points of attachment of the undercarriage, and in carrying the lines of the fuselage into the fin and rudder. The cowling and fairing of the center nacelle and its support is a beautiful piece of work. A remarkable consistency of line has been

The saying that engineering development progresses most rapidly in periods of business depression finds no better illustration than in the recent activities of the Ford Motor Company. With good business conditions at their lowest ebb in the industrial history of the country, Mr. Ford has seen fit to take advantage of the reduced pressure on his production departments to engineer radical departures from established standards in both the automotive and aeronautical fields. The long expected eight-cylinder car, and a large passenger transport airplane involving features never before attempted in American design practices, are the tangible results of these efforts.

advised throughout the entire plane. Immediately in back of the pilot's cockpit is a small compartment which will probably be used as a smoking room. Continuing aft along a center aisle, there are two passenger compartments, two washrooms, (one on each side), followed by two more passenger compartments. The aisle thus passes between a baggage room on the port side, and a galley in starboard, and ends as a transverse passage with baggage doors on each side of the fuselage. A doorway also gives access to the rear part of the fuselage and the tail wheel at-

terribly. Each of the four main passenger compartments has seating accommodations for eight persons. Evident that the center aisle is narrower, each compartment has the same dimensions as a double-section of a standard railway sleeping car. The main one of the round wings and depth and the cushion divide down and across to form a sleeping berth of standard railway size. Folding upper berths may also be installed. The machine may thus be converted from a daytime passenger carrier into a sleeper whose accommodations are similar to those available on the railroads. It is not the standard

fuel storage equipment be carried in the daytime, however, but rather that the upper berths, washrooms, pillows, bedding, etc. be installed at the point of departure for night runs.

The descriptive scheme of the entire structure is decidedly modern. Every possible device has been attached for the comfort and convenience of the passenger. The galley is equipped with a stove and refrigerator. A lock-in mechanism system makes it possible for passengers to maintain the stowage from any compartment. Great care has been taken in insulating the cabin against sound, and temperature variations. The walls and ceiling are of double construction throughout, enclosing a relatively large volume of dead air space, and the interior padding is of composite construction consisting of a heavy wool core between sheets of aluminum. Thick pads of insulating wool are provided in the roof and side walls in the vicinity of the engines and propeller to further reduce noise, and to insulate vibration in the plane of the propellers.

A complete thermostat-controlled heating and venting system is installed. To prevent the disruption of the normal functioning of the air supply, all cabin windows are fixed in their frames and cannot be opened. Fifth deck doors are screened and sealed first

limited machine. In flight, the air pressure is available for positive reversion.

The retracting gear is arranged so that the landing wheels may be extended or retracted together or separately. An indicator on the dash board shows the position of each wheel, at all times. A large green ball-type on the instrument board is lighted when the wheels are extended. The engine starting system also supplies high pressure air for operating the retracting gear.

The instrument has an emergency bearing on maintenance. Ordinarily, when "parts" are badly in the way when it comes to adjusting brakes or changing tires, and replacement time can be wasted in removing and reassembling them. On the new Ford, however, the fully extended wheel is entirely clear of the landing, and maintenance operation may be carried out without delay and without disturbing the bearing. Removable pins in the strut and radius shafts give easy access to the shock units and to the radiator connections.

The main wheels and brakes are of hydraulically operated, two shoe design on heavy 20-in. high-pressure tires. The brake pressure is not applied directly from the feet pedals, but through air-operated "servo" cylinders which in turn send an large boost and heavy thrust, located under the main seats. The high pressure air, which is bled from the engine starting system is not controlled from a combination rudder and brake pedal.

The location of the tail wheel in somewhat unconventional tail fin position instead of being situated at the rear of the fuselage, as is common practice, is mounted in a well in the under part of the fuselage just aft of the cabin nose. This arrangement reduces the drag of the fuselage at a portion of the landing stresses in a three-point landing. The wheel and shock struts are approximately the same size as those originally used on the standard Ford Model 5-A7 for extra landing wheels. Due to the wheel mounting may be bled from inside the fuselage.

Tail surfaces

The tail surface assembly is quite conventional. The fin is built as an integral part of the structure of the fuselage, and supports the stabilizer and elevators above the top deck line of the fuselage. The fin is fixed, but the stabilizer is adjustable in flight, through a reflexible, single screw-gear device located in the fuselage. Both rudder and elevator are of the balanced type. All tail surfaces are of corrugated Alclad, covered over duralumin frames.

Cockpit and control

The novel wheel type dual control is provided in the cockpit. Throttles and mixture adjustments are located on a

pedestal between the pilot's seat and the fuel supply, and the mixture string are controlled from a small panel mounted over the cockpit doorway beyond the pilot. Radiator shutter control for radiator control, and the starter lubricating system mentioned previously are all located alongside in the remote control compartments. They must be manipulated by the cockpit or flight mechanic. A cover locked in place over the control handles prevents vital or accidental manipulation.

The instrument has an emergency, etc., are located wholly within the vision or fastenings. Engine controls, flying controls, and engine planning are built under the main floor, sections of which may be lifted out to give complete access for inspection or adjustment. All fuel valve and auxiliary adjustment controls run from the cockpit through the bar-air ducts in the cabin ceiling. The boost section of the main air vent is in place seems to rotate and adjust. Every movable connection, hinge, or pulley, is carried on self-aligning ball bearings, which are locked in place at assembly and should

never require attention throughout the life of the airplane.

Engine and navigating instruments are concentrated in a single panel in front of the pilot. All dials are self-illuminated. In addition to the usual assortment of instruments and indicators, a fire alarm signal system has been installed. Quanta bulb thermometers are strategically located along the engine compartments and in case of an unusual rise in temperature a large red plate ball-type is lighted on the instrument board. A 20-in. lamp behind each ball-type means that the signal will be instantly visible even in the brightest sunlight.

Due to the absence of a nose engine, the view forward and downward from the cockpit is excellent. A sliding rear view mirror installed in the roof over the cockpit permits other officer to observe the operation of all three propellers, as well as to check on the approach of other aircraft from the rear. A warning indicator for engine running electric current is mounted on top of the fuselage back of the center console in the department of the propeller.

Shooting the clouds

The Weather Bureau's clinometer measures their height

A new instrument for measuring the height of clouds above an airport has been designed and developed by Prof. Charles F. Weaver, chief of the Weather Bureau of the United States Department of Agriculture. Its purpose is to measure the popular distinction of a cloud at night presented in a cloud at night. It consists of a sighting tube equipped with eye piece and cross wires, to which a quadrant scale reading from 0 to 90 deg. is rigidly

attached. A pendulum pivoted on a horizontal axis hangs vertically of its own weight when the tube is sighted on an object. The zero line of the scale is indicated by the pendulum when the tube is sighted on an object at the same level. A small dial with a hand, turning a circular scale, shows the pendulum in position after a sighting has been made.

To use the instrument, a vertical beam of light is focused on the overhanging clouds from any one of a projector whose beam may be adjusted to the vertical. An observer with the instrument takes up a position at some known distance from the projector, usually 500 or 1000 ft. By sighting on the spot of light on the cloud, and reading the indicated angle directly from the scale on the clinometer, the height of the cloud above the horizon may be readily calculated. For any given base line a table may be readily calculated so that the reading of the instrument may be converted quickly from degrees into feet of altitude.

The Weather Bureau is supplying this type of equipment to stations that have personnel, but lack other means of measuring cloud height. Instruments about cost table of altitude for bases less than 1,000 and 1,500 ft are sent out with each instrument.

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EDITORIALS

AVIATION

EDWARD P. WALKER, Editor

An aviation platform

(Continued from March)

AVIATION'S platform proceeds freely to its due. In the four months in which it has drawn our official pages we have presented some thirty issues. None of them have lost anything of their importance over the last three months. Upon none we could speak much more forcefully now than at the time when we first mentioned them.

The platform is for the time being complete, but we are not through with its planks, and we do not expect to let the industry forget them. We shall return to them again and again, individually and in more detail. A year hence we plan to run them up again, and at that time we hope they will be rushed progress is noted on at least a substantial majority of the thirty-and headings.

Manufacturing (Continued)

6. *Develop an industry policy on the regulation of commercial design and construction.* Though the relations between the Department of Commerce and the aircraft industry are mutually harmonious, there are many manufacturers who feel grave concern for the future. We cannot rely upon an indefinite continuance in effect of personnel of such exceptional experience and gifts as are possessed by Secretary Young and those who immediately succeeded him. Even if we could, the present system of government control is scarcely capable of sustained extension in exactly its present form.

In developing a long-term policy of regulation of civil flying, one of four alternatives will have to be accepted. Regulation may be entirely abandoned. It may be maintained on the present basis with one or twenty times the present inspection force and annual expense. It may be turned over in part to state and local authorities. Finally, it may be handled, as a gradually increasing degree, by private or semi-private organizations in which the industry itself exercises control.

Manufacturers have done a great deal of lip-service to the ideal of self-regulation of the industry. The trend is east European countries generally wish more de-

vised to the extension of governmental authority than in America, has been towards the departure of government from the field of aircraft regulation in favor of private control. But when a concrete proposal is made it receives but little sympathy from American manufacturers, who fear it means what they would have to pay for a supervision which they now receive free of charge.

The Department of Commerce has shown itself, and we believe it will continue, willing to cooperate with manufacturers, operators, and insurers on any reasonable terms. It is true for the industry to begin to look to the future. There are some things that must continue under the Department's control. We anticipate, for example, that the licensing of all pilots by the Federal government will be a permanent institution. But there are other phases of the regulatory work upon which one cannot be so sure.

We purposely refrain from making any pronouncement as to the industry to decide what it will do, but we prophesy that unless some definite course is plotted for the future we shall see the control of aviation in the Department of Commerce becoming more and more a department of compromise. It may well be that in one of the Department's divisions, as such consideration, but the inevitable regulatory pressure of government and the increasing of Congressional demands that "something be done" after every aircraft accident will force them further and further into the field. It may be that that is what is wanted, but if not—if it is felt, as many manufacturers individually express themselves as feeling that indefinite extension would be very dangerous to the free and sound development of aviation—then the industry should buy itself with the development of a policy which will provide satisfactory substitutes or supplements for government control.

7. *Survey all the use of aviation in industry.* There may be some people engaged in building or flying aircraft who still believe that airplanes can be fitted indefinitely into any kind of a business enterprise. Three years ago it was rather fashionable to suppose that every living snake engaged in long-distance hauling could probably be replaced by a plane. Most of us have had a great awakening since 1929. Most of us



Professor Charles F. Weaver
with the clinometer

now realize that the business use of airplanes has to be highly selective.

Some branches of industry need airplanes, and find them almost indispensable. Others don't. We cannot expect that the individual proprietor or manager of a business is going to take the trouble to find out for himself in which category he belongs. We have to be prepared to tell him that we are right.

There have been studies in the past of the industrial use of airplanes, but they have suffered from a scarcity of experimental data. We have enough experience now to do the thing in proper style. An analysis printed in the statistical issue of AVIATION shows more than 200 planes licensed in the names of industrial owners. A large proportion of them have been in service for at least two years. We are equipped now to go ahead with a real investigation, and a classification of the kinds of business in which the airplane can be used.

AVIATION can of course do a great deal about that too. We have printed a great many accounts of the work of airplanes in many different fields, and we shall continue that.

But even more could be done through the cooperation of the manufacturers. The service department of the company that sells a man a ship should always remain in close connection with its use. The analysis of experience with airplanes in industry is another cooperative activity for the Chamber of Commerce to initiate or guide. A really careful survey of the material in hand would make a great deal of sense, self-evident in the future, and it would secure a great many new prospects.

In times like these very few airplanes can be sold by getting the customer all excited and collecting his signature before he gets off, or by presenting him with a collection of highly-inflated and false figures which any accountant can shoot full of holes. Sales can only be made by facing realities where our arguments are so strong that they will withstand the most critical and test. As an accessory preference to any intelligent and economical sales effort, we need an all industry survey to divide the sheep from the goats among our possible industrial customers.

B. Give operators an incentive to use planes. Whatever may be done to develop the industrial customer, its potentialities are small compared with those of private ownership. If, or when, the business of manufacturing airplanes becomes a really vast one, it will be because of widespread private purchases. Even now, the private market is by no means negligible. Even in the desolate year 1931, the sales of planes for private use, absolutely estimated by commercial motives have approached \$500,000,000. So a potential exists there, in this more numerous of a single aviation country club estimated for \$500,000,000.

But the market has so far been infinitesimal, compared with what it might be. There are hundreds

of ten thousands of Americans who have the money to buy planes, who have the taste for sight travel and the taste for sport, who are not in the least afraid to fly, but who simply haven't been given any reason for purchasing that appears to them as adequate. Very few of them are disposed to buy an airplane in order that they may keep it at a municipal airport and fly occasionally for the sheer love of flying.

They want congenial company in their purchases and most of them, like most judgments, want the price of competition. If we are to have a properly growing market for private planes one of our major needs is for the development of more aviation country clubs or something very like them. Flying needs a new social standing. It needs a gathering-place for those who practice it. It needs, even more than yachting, a club house.

And it needs competition. The air races that have been held in the United States in the past twelve years have almost without exception, been planned from the point of view of the audience or of the professional pilot interested in winning prize money or enhancing his own standing in his profession. As a general rule, no one has shown the slightest interest in what the amateur pilot would like to have, and not the slightest effort has been made to enter to him. It ought to be the concern of the manufacturing industry to do so for there could be no better way of stimulating the market.

So far from initiating or competing in measures that might give spectators an incentive to own airplanes and give the present owners a new interest in using their machines, a considerable section of the industry seems to have gone out of its way to create private ownership and to restrict its development for the private owner. The indifference with which the sportsman pilots have often been treated at great aeronautical gatherings has been notorious. The national observations on the "blue-blood" derby at the National Air Races last year were typical. Certain professional pilots maintaining a group of private owners, have been outwoken in this disdain for the amateurs, simply because they were amateurs.

It is somewhat unusual to see a faction in an industry deliberately trying to snuff their customers and to stifle their market. Fortunately that particular group is not very large, but it is not sufficient merely to define them deliberately snuffing the potential private owner. He must be sedulously wooed. The industry must give him a reason for wanting, and it must find as many extraordinary things as possible that he can do with his airplane after he has bought it.

C. Get more airplane men. Sportplanes and amphibians make a particular appeal to the type of sportsman that can afford to fly and that ought to be flying. Unfortunately, however, the typical customer drawn from that class demands convenience of use. At the present time we cannot assure it to a proper degree.

Except for mail stations there are only a dozen

airplane bases in a thousand miles of Atlantic coastline. The Pacific fares even worse. Of the few that do exist on the East Coast, the majority are grouped within a hundred miles around New York. The private owner traveling by airplane ordinarily has to anchor, with great realizable danger to the plane in case of storm. When anchoring is necessary, it has to be accomplished from a large or dock equipped for handling motor-boats, but with no special provision for the fueling of airplanes, and frequently caused by personnel quite unfamiliar with the handling of a plane.

In spite of all the difficulties, airplane flying has grown in popularity. Its real attractions rise superior to all obstacles. The number of amphibians and flying boats upon the registry has steadily increased. The growth ought, however, to be very much more rapid, and it can be if proper facilities are created. Municipalities that have provided airports ought to supplement them with airplane stations. Other the two can be merged, for a number of coastal cities have their airports on water-front land. Yacht clubs near the metropolitan centers can provide an extra stimulus for a steadily growing proportion of their members and guests in the form of a seaplane ramp and servicing equipment. If the existing number of seaplane bases can be multiplied by ten with the new ones well distributed along both coasts and on the Lakes, the potential airplane market can be increased in the same ratio.

10. Work for better agreements abroad. An agreement was recently concluded between the governments of the United States and of Italy, providing that the aeronautical certificates of each country would be acceptable in the other and that a reasonably free international trade in aircraft could therefore be maintained.

The existence of such an agreement ought not to be the subject of special mention. It ought to be taken for granted. Unhappily, however, the Italy-American understanding is very nearly unique. There are only a handful of countries with which we have concluded any general convention upon the subject of licensing. The general rule is that each nation still constitutes an aeronautical island. Theoretically, most countries are willing to license only planes that have been inspected by their own governments during the course of construction, and foreign trade in civil aircraft among the major states is a matter of special dispensation. As an instrument of transport the airplane goes far to break down the significance of international boundaries. As an article entering into work commerce it finds those boundaries magnified to the utmost.

The recognition of such an agreement of course has to be handled by the government, but the industry, and particularly that part of the industry which has agents abroad, can do a great deal to help out. There have been some American manufacturers who have believed, because of their fear that the foreign manufacturers might invade the American market, in restricting inter-

national trade to the utmost. Their attitude is shortsighted, and shows a wholly unnecessary lack of confidence in their own products. We have no fears for the ability of American planes to take care of themselves in any kind of fair competition, but they cannot take care of themselves where governmental authorities have forbidden them even to enter the race. It is definitely to be desired that there should be the greatest possible freedom of international flying, of international air transport, and of the international aircraft trade. The efforts of the Department of Commerce to secure agreement to that end with all foreign countries deserve the whole-hearted support of the industry.

11. Cooperate in foreign markets. When foreign markets have been opened they have to be explored. No single manufacturer under present conditions can afford to maintain a world-wide sales organization. Occasional "missions" have been sent to various parts of the world by various builders, but they have had to be uncoordinated, and they have touched only limited areas. In the various European countries, and particularly Great Britain and France, have been expanding their foreign trade in aircraft as the result of the activities of governmental or semi-governmental missions, covering a succession of foreign areas and presenting the products of the national industry as a whole.

The precedent established by Great Britain and France deserves very serious study here. We cannot expect, under our system of government, that the Department of Commerce will undertake to organize the demonstration of American products. The Bureau of Foreign and Domestic Commerce is already providing an available conduit for the flow of information about foreign markets to the United States and for the passage of data on American products to the foreign countries. The aircraft industry ought to go further, and to organize a more aggressive campaign to prove the quality of American planes, engines, and accessories. The first requirement is that the foreign markets should be approached with American products. The competition of American manufacturers with each other is a secondary matter. If our builders go into a foreign market principally to criticize each other's products they will all feel their position seriously weakened in against their competition from Europe.

There is an export division of the Chamber of Commerce which has done very useful work in simplifying the routine of foreign trade, but much more than that is needed. The Webb-Pomeroy act specifically permits American authorities to form associations for engaging in foreign trade, and to employ cooperative tactics to an extent that would be in conflict with the anti-trust laws if possessed dominantly. Either within the ranks of the Chamber of Commerce or through a separate organization newly formed, American aircraft manufacturers should band themselves together for the development of foreign markets and the safeguarding of American aeronautical prestige.

NEWS OF THE MONTH

Air mail hearings

HEARINGS on air mail matters were held by the House Committee on Post Offices and Post Roads March 1-4. Indications are that no substantial change will be made in air mail policy this session, since the committee apparently has been convinced that nothing is seriously wrong and that it would be unwise to attempt basic changes by legislation. Members appear to feel that some of the shortcomings of contracts were somewhat worse but there is no considerable demand for general cancellation.

Two matters brought up in the hearings, receiving primary consideration, are the advisability of an amendment to the air mail act specifying a maximum basic rate of pay for pilots, and a bill requiring that household extension be made without competitive bidding.

to the exclusion of others on the award of most contracts. The measure seeking cancellation of all contracts awarded without public advertisement, in his opinion, called for irreparable breach of faith on the part of the government.

W. Irving Glover, second assistant postmaster general, bluntly admitted as much could be carried for considerably less than the present appropriation. The issue, as he defined it, is whether Congress wants merely to provide for the transportation of air mail at minimum cost, or to finance the carrying of mail as an instrument for developing a sound commercial air transport system.

The policy of the Post Office Department is to avoid the award of air mail contracts to "shamming operators" and to concentrate the air mail business as far as possible in the hands of the larger airlines, Mr. Glover explained. As passenger business increases, the pay for carrying mail is reduced so that eventually the post will be reached when the greatest will be self-sustaining.

It was emphatically stated by Mr. Glover that some facts are being ignored

to the exclusion of others on the award of most contracts. The measure seeking cancellation of all contracts awarded without public advertisement, in his opinion, called for irreparable breach of faith on the part of the government.

For more control

One congressman suggests the Post Office Department be authorized to keep more closely the equipment and supply personnel of air and nonaviation departments. The regulations of the Department of Commerce are not stringent enough. Mr. Glavin refused to be led into saying anything concerning the Century dispute. He was reminded several times that the Comptroller General has seriously questioned the right of the Post Office Department to award or make contracts without public advertisement. In response, he declared that every contract under contracts has been passed upon and approved by the Comptroller

Frank E. Gruber, speaking on behalf of the Air Line Pilots Association, declared that Century could make good on the offer to carry the main cabin at 80 per cent the present cost. The pilots' association includes 75 per cent of the pilots actually engaged in sched-

Calendar

May 20-30	International conference of pilots youth. Issues include: traffic management, flight safety, and noise abatement.
May 20-31	Swedish-Polish Baltic Sea Cooperation Conference, Åre, Sweden.
June 10-18	1994 International Air Transport Association (IATA) World Conference, Amsterdam, The Netherlands.
June 21	Job, Airport, Budget, Air Force Conference, Washington, D.C.
July 8-9	Plung's 9th Nordic Roundtable Conference, Reykjavik.
July 10-18	Third American-Bosnian Inter- national Conference, Washington, D.C.
July 22-23	1994 International Air Transport Association (IATA) World Conference, Amsterdam, The Netherlands.
July 28	Pro-Compactly on Shores, San Diego.
Aug 4-6	International Building Conference, Washington, D.C.
Aug 10-13	International 4th Year Conference, New York, N.Y.
Aug 27 (Sept 1)	National Air Route Conference.
Sept 1-2	European Road, Brussels, Belgium.
September	International Air Transport Association (IATA) World Conference, Amsterdam, The Netherlands.

pled throughout flying in this country. Mr. Cernullo told the committee, and most of the other witnesses, that the closest relations exist between them and the other operators except Mr. and Mrs. Cernullo. They are about 450 miles apart, and he estimates an average pay of \$600 a month.

A representative of Century, taking vigorous exception to the testimony presented in behalf of the pilots' association, stated, in effect, that the Century pilots are paid \$2,000 a month to perform the kind of work that is done by the other Cord interests who are awarded a contract for carrying air mail between Atlanta and Los Angeles at the same rate of compensation as the present contract. He stated, in effect, that the difference in pay between Century pilots and other pilots is due to the fact that the other operators are subsidized by the government, while Century does not solely on the revenue derived from pas-

Century dispute continues

The dispute between Century Artists and the Century pilots has dragged along without any shadow of a settlement. Century in the first few weeks announced an unexpected death of qualified pilots in response to its appeal for more pilots. The pilots' representatives for more than a month, and even the pilots have not been recruited. An AIRWAYS goes to judge. The dispute between the company and locked out pilots was rare in Congress and the Chinese enterprise. The pilots' representatives have been in a position to negotiate with the company's representatives, including various acts on the part of the pilots and the company on the veracity of the pilots and the company's representatives. The pilots have been in the hands of the company's representatives.

The infection did not spread to Century Pacific, which began operating overseas in 33 Phase in February. On March 12 it lost its permits for a certificate of necessity and convenience from the state of Arizona. American Airways had objected strenuously to the ground Century Pacific was attempting to operate. American had purchased the common stock Century's service not necessary at the present time. On Feb. 11 Century Pacific's planes were hastily purchased by passengers transferring from trains held up by snow in the Yellowstone mountains.

Varnes, *continued* *Alb. Fossils*

Vance Air Ferries has begun operating the service which it took over from Air Ferries, flying nine round trips daily between San Francisco Bay and Oakland. Connections are made with the Vance Speed Lines planes operating between Los Angeles, Sacramento and San Francisco.

Pax American has issued a traffic report for 1991 stating that passenger traffic jumped about 17 per cent over that for 1990. A total of 48,575 passengers were carried in 1991 as compared with 41,498 passengers the year before. Mail payloads increased 85-184 lb.

Pan American and American Airways have reduced passenger fares

- New airline division

American Airways has consolidated the Embassy-Roadside and Universal divisions into the new central division Headquarters are at 30 Route 1 under direction of Col. Rodney Dwyer, vice-president. H.D. Smith, executive vice-president, operations, and Charles W. White, general traffic manager, P. J. Havet, superintendent of maintenance. Ben Bell, superintendent of overhaul. John Paul Riddick formerly general manager of the New York office has been transferred to the New York office as head of the operations department for the entire company. Routes and schedules continue as before. The company's New York terminal has been changed from the former site located at 30 West Broadway to the new site at 30 West Broadway. The New York terminal has been placed on the New York Montreal non-stop passenger service.

Northwest has successfully provided passengers with individual video screens based on an experimental program during flight, now American Airlines has adopted the same idea. The first of its machines so equipped has been turned out at the Dallas shops, others will be fitted out as they go through the shop for overhaul.

¹¹ Air would be free

Imperial Airways is encouraged by the fact that the business, once in south-eastern India, and Burma, have asked that permission to use Decca and French mail planes for the inauguration of air India mail. The two foreign companies have been permitted to cross India but not to pick up or mail in that country. Imperial Airways has been kept out of India altogether except for the operation at Karachi because the Indian government wishes to develop the air India services itself. The demand of foreigners, even for permission to use the foreign services, indicates a demand may follow for cargo.

A sum of \$250,000 has been made available from a fund established some time ago for the development of railways and other means of communication between Cairo and Cape Town, for improvements in airport infrastructure and communication facilities along the Imperial Airways route in Africa.

Corporation Aeromexico de Transportes temporarily suspended its Mexico City-Tijuana and Brownsville-Mexico City services Feb. 10. The suspension was approved by the Mexican Ministry of Communications, which recently inaugurated protocol inspection of all air transport companies and their equipment operating in Mexico. Cu de Transportes Aereos Mexico-Cuba has started a daily mail, passenger and express service between Mexico City and San Antonio, Nuegueros are used.

Jaguar Air Transport has been operating a shuttle between Mbinda and Harare to test traffic conditions with a permanent airport in view. French and Belgian interests continue to press ground work for the establishment before autumn of their proposed joint air service from Europe across central Africa. The Spanish government-subsidized airline has been liquidated by the new Zimbabwean government.

Mail speeded up

Transcontinental & Western Air has reduced its 25-hour-a-day service between Los Angeles and New York to 22 hours 42 min. Mail leaves Los Angeles at 1 p.m., instead of 3:05 p.m., and will reach



SIDE SLIPS

By Robert R. Osborn

DURING the last few years, unendingly repeated new designs and new changes had been going on at such a hectic rate that we finally gave up trying to keep track of them. We had anticipated this was necessary in stock market matters, but now we are somewhat startled to find that even the business had gotten tangled up a bit, and wouldn't exactly say what could they were holding. We quote from a financial statement just received:

"Through inadvertence, annual letter to stockholders dated Feb. 17, 1932, contained the financial statement of Intercontinental Transport, Inc., without including therein the statement of its subsidiary, Jupiter-Mar Air Lines Company. We are now enclosing the Consolidated Income and Profit and Loss account of Intercontinental Transport, Inc., and its subsidiary, Jupiter-Mar Air Lines Company, for the year ending Dec. 31, 1931, and Consolidated General Balance Sheet Statement for the same date."

There was some discussion of airplane performance in a recent issue of *AVIATION* which we mentioned the story of the airplane which had to be delivered to a South American country, after being built at the United States. After the planes were well on the way (so the story went) it was discovered that their ceiling was less than the mountains they had to cross, so the planes were sent to load the planes near the tops of the mountains and two men were to Ap-



mountain point, look the crane and allow the plane to find its way. Description of a new "load-carrying" plane built by D.H.S.

"The pilot often complains about getting all ways out from holding rubber-tying to keep their planes from heading back to the house longer, and there'll be glad to know that a small and push rod combination might help out:

For some unaccountable reason, when the aviation boom struck once a few years back literally thousands of people became obsessed with the idea of carrying an electric drive in an airplane for the first time in history, and that more was being reported in on these odd ideas for years. We did not see to get more straight but the terrible effect the rubber tires had on people in aviation is apparent even today—now, that without tires become big business, they are said to be carrying them, but then they never had to be replaced at all.

The copy of the following letter, sent out by one of the large air firms was mailed to our editor by T.G. of Chicago. "We wish to apologize for a drop up whereby we have mistakenly delayed a recent package which went to our Chicago field and was forwarded on to Chicago before the correcting info-

was received. The package got into our stock room and because of the marking showing as planes, it was opened and then the carrier lost before we got it started back. Everything went wrong and even when it was packed and ready it didn't get into the service desk and hung over two planes. Sorry, and will try to do better next time. The enclosed is a picture in D-88962 "Adjusting Transformers" wherever they may be."

We have always pointed with pride to the Department of Concentration. Auto motor branch, as at least one goes.



most group against which these wasn't even the slightest suspicion of corruption. However, Mr. V.D.B., Jr., of Liverpool, Cal. has sent us an advertisement from a contemporary service, local magazine which implied the possibility of serious charges against the Department, but we are hoping that the inevitable Congressional investigation will clear their inherent unbecoming record. The advertisement, appeared in the classified "Airplane for Sale" section and read: "Gaines and Archon motor, completely renovated, just re-finished at a very reasonable price. Look ship over and make offer."

Possibly in spring letter that has us in its grip—maybe we are affected by a too long exposure to the depression—its very close, whatever the cause, our outlook hasn't been at the observed level. So, we are notified to disagree radically with statements we read in a recent report on airships. "It follows that the selected true certificate is used at low values of the lift or at high loads."

Our hangar flying department

APARENTLY Mr. at a momentous hands to give us a very hearty appointment. Just we have information coming in to believe that this is true at least of the aircraft carriers in Navy service. Edward Nassau, field engineer for one of the large airplane and engine manufacturing groups, was a guest of the Navy during one of the cruises of the *Saratoga*, and the first night we needed to deal with the chief petty officers. He reported he had been actually reached out to argue a portion of stock from a place which was placed in the corner of the table, and the ship went to him, making a fork into the back of his head, put it on his plate and had given on it before it could pull it back.

FLYING EQUIPMENT

Gutherson diesel engine

DURING the 1921 aircraft show at Dayton, a new aircraft diesel engine was exhibited by the Gutherson Diesel Engine Company, of Dallas, Tex. During the year that has intervened the engine has undergone extensive testing both on the ground and in the air, and is being exhibited in commercial form in this year's show. Its most important feature is that the engine resembles a standard crank-in-valve type very closely, and many structural details are also similar. The crankshaft, master rod assembly and crossheads are of conventional design, but with an increase of from 7 to 10 per cent in weight over the averages to take care of the increased loads and stresses encountered in diesel power. The engine operates with a compression pressure of 400 lb. per sq. in., while the exhaust gas pressure is maintained under 1,000 lb. per sq. in.

Each cylinder has a single poppet valve in the head which controls the intake of incoming air and the discharge of exhaust gases. Cam-driven fuel pumps connected directly behind the cylinders supply the oil under pressure to the injection nozzles at the proper time in the cycle.

The valve stem is mounted in the conventional manner on the crankshaft in the rear part of the case, driven by an intermediate gear at one-eighth crankshaft speed. Since the valve motion is somewhat different from standard practice, due to the fact that only one valve is used for both the incoming and outgoing the four valve lobes are comparatively long as the valve can be held open for some 90 deg. of crank travel. Fuel supply is controlled by the four valves and also has their lobes in speed to give the proper injection time.

Working on the fuel case are four air type injection pumps, each actuated by fuel pump and so arranged that the length of pump stroke is under control. The fuel pumps are mounted in the rear case in line with the pump levers. The



Partial section of the Gutherson diesel

fuel is supplied through drilled ducts which lead to the oil in crosshead temperature before injection. From the pump the oil passes through check valves and into open type injectors at the combustion chambers. Each injector is located in the cylinder head, and is easily dismantled for inspection and cleaning.

As piston clearance is very small each piston head is counterbored to permit the opening of the valve. The head is also grooved in line with the injector nozzle to allow the fuel spray to penetrate the combustion chamber. The air inlet manifold is designed to cause a swirling motion of the air in the suction stroke, and the irregular shape of the piston heads adds to the turbulence during compression. The intake port opens forward to correct the air, and is set at the proper angle to utilize maximum pressure of the atmosphere. Exhaust port is in the rear and on the opposite side of the cylinder head. Baffles are arranged to assist in cylinder scavenging.

One of the most interesting features of the engine is the method of control. By means of one centrally operated lever, the stroke of the pump is varied as the time of the injection is advanced or retarded. The direction of the injection is changed in proportion to the amount of fuel pumped and the rate of the injection. By moving the control in the extreme position below the idling point, the air valves are held open, and the engine compression is totally released. This decompression introduces the air into the cylinder, which permits the propeller to turn freely in a glide with the engine dead. The engine may be started again from a normal glide by merely adjusting the throttle. Decompression is also of vital importance in facilitating an inspection and servicing of the engine.

The engine is to be of the order of 100 hp., weighing a total of 550 lb., and the model of 200 hp., weighing 640 lb. (total weight of the larger of the two are not available, but the manufacturer has furnished the following approximate figures for the 100-hp. engine: Number of cylinders, 9; rated horsepower, 102 at 1,525 r.p.m.; weight, 550 lb.; weight per horsepower, 224 outside diameter, 46 1/2 in.; overall length, 54 1/2 in.; bore, 4 1/2 in.; stroke, 6 in.; displacement, 902 cu. in.; fuel consumption (maximum), 84 gal. per hour; fuel consumption (cranking), 84 gal. per hour.

The Wilford gyrophane

CONSIDERABLE experimental work has been carried on at the Main Low Airport, Peoli, Mo., during the past year, as a new type lighting unit, the gyrophane, is being developed by Wilbur Kessler and Walter Kessler, and may be developed in the United States by the Wilford of the Pennsylvania Aircraft Syndicate.

The machine differs from the Cueva type airplane in the method employed to separate the lift on opposite sides of

rely the sort of thing was not so unusual as we had thought, judging by a picture from the San Diego Times, and as by W. A. McEl of San Diego.

"From St. Louis to Quins, only 130 miles, took three days, for the Avia was intended had to be ground and the plane had to be carried to an altitude of 17,300 ft. to do it."

Yes, my reminder our discussion of the coming new Russian airplanes is

DESIGN NOVELTIES

Electrifying
the airplane

NOT every power line strung across the sky electrical problem as an airplane leaves the engine system system involved only the running of a pair of wires from the magneto to a switch and instrument board. Nevertheless, however, with complicated starting and lighting systems, and the radio, the problem has become really involved. Unless it is treated in a major item during the design period, a misinterpretation of experience and mis-connection wiring may really result that will prove not only unnecessary and expensive, but positively dangerous.

In the P-50A Transport (AVIATION, November 1951, page 654) built by the American Aircraft & Sling Company of Farmingdale, N. Y., a careful study was made of the disposition and interconnection of all electrical equipment. The heart of the system is the power supply and distribution compartment, all of the fire wall in the left side of the fuselage below the pilot's cockpit. Access is gained from outside the airplane by removing a section of the side paneling. The compartment contains two dynamometers for radio use, a storage battery, and a terminal panel, together with incidental electrical equipment. All wiring has been brought out to the terminal panel which makes it a simple matter to test on ground. Outside the compartment all wiring is carried in aluminum conduits through junction boxes. A novel mechanical feature is the mounting of the battery box on an enclosing duct (built on the principle of a continental floor cabinet) so that it can be pulled out of the compartment for servicing.

The radio transmitter and receiver are located in the rear part of the fuselage adjacent to the radio mast.

The timing and volume controls, as well as all light switches are conveniently located on the pilot's instrument board. Fuses and switches are mounted in a panel which may be easily swung inward from the face of the board for inspection or adjustment. Although the electrical circuitry is really more complicated than those of 1920, careful planning during the design stages has resulted in actual simplification from a maintenance point of view.

Improving
cabin ventilation

IT HAS been well established that even minute quantities of exhaust gases in airplane cabins tend to cause air sickness. Believing that a certain amount of contamination of this sort cannot be avoided when venting air is a natural by-product of the engine as in common practice C. F. Jenkins, of Washington, D. C., has designed a fresh air intake manifold whose inlet is located just ahead of the engine behind the propeller. By supplying all air for ventilation from one or more ducts arranged in this manner, a continuous supply of uncontaminated air is assured.



Below: Electrical power supply equipment at the P-50A. Above: The engine compartment of the P-50A. Below: The engine compartment of the P-50A. Below: The engine compartment of the P-50A.

Mastless
for Condors

AFTER some months of experiment the Curtiss Condors flown by Eastern Air Transport are being equipped with newly-designed mastless developed under the direction of Ralph D. Lockwood, chief engineer. Service tests have indicated that the mastless has 100% of any effect on the operation of the engine, and that this is very effective in reducing noise. Instead of mastbuilding and endbracing each bank of the Condor engine individually the exhaust pipe from each set of exhaust exhaust ports is connected forward and across the nose cowling of the nacelle. The same pipe continues



The air intake from the propeller exhaust ducts is led to the cabin.

SERVICING SHORT CUTS

Blackboard
engine log chart

A GOOD example of the Markboard-type engine log chart now used by a number of airlines to keep track of engine service and overhaul is in use at the Oakland headquarters of the Pacific Air Transport division of United Air Lines.

Aluminum tags which are punched with the name of each airplane in service are hung as tags in a vertical column at the left of the board, large tags being used for re-engined planes and small tags for the single-engine equipment. Opposite each plane there are one or three tags respectively corresponding to the number of engines. Aluminum tags are used to designate Pratt & Whitney Wasp engines and brass tags are used to designate Hercules. Horizontal columns extend across the board opposite each engine with vertical lines to represent each five hours of operation. A heavy white line is used to mark the 100- and 200-hour periods and a heavy vertical red line marks 300 hours, at which all engines are overhauled. Each day the shop foreman checks the log at each engine and brings the Markboard record up to date.

By constantly checking the engine time record on the board it is possible to schedule the operation of the various airplanes and engines so that the engine will come up for their 300-hour overhaul in proper sequence, and the shop is never overhauled due to a mis-

take of engines reaching the overhaul period at the same time. This chart also eliminates the possibility of running any engine beyond 300 hours without overhauling.

Engine tags representing spare engines are hung in a column at the lower left hand corner of the board, an column showing whether the engine is serviceable or unserviceable, in the shop, or in storage. Additional read-

cardboard tags hang on pegs along the base of the board are used to designate the location and condition of all planes actually in service.

Structural steel
repair jig

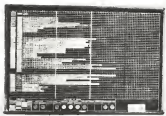
REMAINING damaged members in the fuselage of Pitcairn Mailships, at the Alhambra Repair Dept. of Eastern Air Transport, Inc., is usually facilitated by the use of a heavy structural steel jig, into which the service fuselage may be firmly clamped. Once the fuselage is leveled up and fastened into position, repair work may be carried out without danger of serious misalignment of the structure.



Below: Repair jig at Eastern Air Transport. Above: The Markboard log chart for engines, at Pacific Air Transport. Right: Portable hydraulic hoist at United Airlines Chicago base.

A portable
hydraulic hoist

FOR engine repairs and for removal and replacement of engines, the Chicago base of United Airlines is finding considerable use for a portable hydraulic hoist manufactured by the Allen Brady Company of Thetford, Ill. It is a self-contained unit incorporating hydraulic cylinders, valves, and electrically driven pumps. Its mounting on a wide spread chassis allows portability without the necessity of skidder. The machine is capable of handling the largest engines now in use.



THE BUYERS' LOG BOOK

Light relay

For controlling electrical or other apparatus from the remotest of light the Weston Electrical Instrument Corporation, Newark, N. J., offers the Photoelectric Cell, a new type of photo-electric relay.



Photoelectric cell

cell consists essentially of a thin metal disk on which there is a film of light-sensitive material which forms a sensitive terminal while a metal cathode ring is coated with the disk forms the positive terminal. The unit is contained in a molded bakelite case, 2½ in. in diameter and 1 in. thick, having a glass or quartz window and connecting plugs to fit a UX radio socket.

The Photoelectric Cell delivers about 14 microamperes per foot-candle of light intensity or 120 microamperes per lumen. No amplification is required for ordinary use, and sufficient current is developed to operate Weston relays directly without auxiliary apparatus. At present the life of the cell is believed to be unlimited.

Applications are found in airport beacon control, precision recording, time switches, and in many other phases of scientific activities. The Model 904 Photoelectric Cell is inexpensive and may be purchased separately or in connection with suitable power relays produced by the same manufacturer—*Aviation*, April 1932.

Roll cutter

M. E. Porter, Inc., of Everett, Mass., has added a new cutter to its line of ball and roller cut-off tools. It is small in overall size (7½ in.

long) and is designed to operate on limited spaces where the ordinary ball cutter cannot be used. It will cut balls up to ½ in. in thread diameter, and round stock up to ½ in. in diameter. The tool consists of a cutting head with the jaws operated by a power source turned with an ordinary 4-in. electric wrench—*Aviation*, April 1932.

Heating units for clothing

Light, flexible electrical heating units, designed for use in flying suits, winter gloves, etc. for high altitude flying in cold weather, have recently been announced by the General Electric Company of Schenectady, N. Y. Each unit consists of a thin rubber strip about 4 in. wide and 12 in. long, having a heating element designed to work on a 25-volt airplane storage battery, unleaded acids. Each unit draws about 4 amp. and is used as about ½ watt. The Army Air Corps at Wright Field has been experimenting with these units for

winter operation—*Aviation*, April 1932.

Shielded spark plugs

The Champion Spark Plug Company of Toledo, Ohio, has just announced a new aviation spark plug incorporating radio shielding. A ceramic dome over the terminals not only protects the plug against short circuit by dirt, rain, ice or oil, but it eliminates radio interference and protects it against mechanical damage. The plug, which is designated as the Aero-RA, is adapted for use in practically all types of air-cooled and high compression water-cooled engines. It is made up in two sizes, sizes of which can be purchased separately as required—*Aviation*, April 1932.

Piston rings

Piston packing rings for all types of internal combustion engines, air compressors, etc., are being offered by The Steel or Bronze Piston Ring Corporation, Indianapolis, Ind. Rings are available in any diameter from 1 in. up to any cross-section desired, in either alloy steel or bronze, depending upon the requirement—*Aviation*, April 1932.

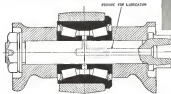
Automatic sprinklers

Sprinkler fire protection systems for ships, airports, etc., are manufactured by the Viking Automatic Sprinkler Company, 480 East Olive St., Chicago. The Viking equipment includes not only standard deluge systems, but also a protection system designed to sound an alarm at temperatures below those required to open sprinkler heads up that small fires may be controlled by hand extinguishers before the deluge system is released. In case the warning is overlooked, however, the sprinkler heads go into operation with further increase in temperature—*Aviation*, April 1932.

Fireproofing paint

The Specialty Trading Company, of 9 Via Radini, Milan, Italy, is offering for sale a fireproofing paint designed to reduce the fire hazards on airplanes and other structures. It is claimed that the paint, which when applied resembles an ordinary aluminum finish, renders fabric incombustible, even in the presence of burning gasoline—*Aviation*, April 1932.

Good-bye to rocker arm bearing troubles



Photograph Actual Size of Bearing

The Timken Tapered Roller Rocker Arm Bearing was developed to meet the need for a more efficient and enduring rocker arm bearing for modern aircraft engines.

Its design and construction assure extended service; greater dependability; and lower maintenance cost.

"Brinelling", or grooving, of the bearing races is one of the principal causes of short life in many types of anti-friction rocker arm bearings. The long life of Timken Rocker Arm Bearings is largely due to the line contact of the double row of tapered rollers plus Timken-made special alloy steel. The tapered rollers also give

maximum support to the rocker arm shaft, hold it in proper alignment and overcome the tendency of the push rod action to produce lateral wear and looseness. Accurate rocker arm operation is maintained throughout the life of the bearing.

Lubrication is positive under all operating conditions. A high level of lubricant is constantly maintained. Tight closures prevent escape of grease.

The Timken Tapered Roller Rocker Arm Bearing is a compact unit, completely self-contained. It can be installed, removed and replaced in much less time than other types.

Specify this modern refinement when buying new engines.

National Aircraft Show
Booths No. 101 and 103

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TIMKEN Tapered Roller **BEARINGS**



TESTED in the laboratory PROVED in the air. . . .

Laboratory tests prove the special qualities for effective lubrication in Texaco Airplane Oils. Laboratory tests at every stage of the refining process insure the maintenance of absolute uniformity. • Tests in the air, by famous pilots, and by The Texas Company's own planes, prove their qualities in actual service under the most severe conditions of altitude, temperature and long maintained speed-flying. • Captain Frank Hawks in his mystery ship, the Texaco 13, made over 68,000 miles of record-breaking flights without a single engine overhaul. • Texaco Airplane Oils are characterized by their exceptionally flat viscosity curve, low pour point and low carbon residue content. They are ideal airplane engine oils. • They are approved by engine manufacturers, recommended and used by many of the outstanding airlines and are available at leading airports throughout the country. THE TEXAS COMPANY, 135 East 42nd Street, New York City.



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Flying schedules call for swift communication between airports



Teletypewriters send written messages in 2 or 30 points at the same time...whether they are 300 feet or 3000 miles away

It is 10 o'clock. The dispatcher signals, "All Clear." There is a whirr of motors, and the large air lines soar into the sky. In front of the pilot is a typewritten sheet giving latest-accurate weather reports gathered from points along the entire route by Teletypewriter. . . .

The 2 o'clock plane is ready to leave. There is an unexpected call for seats at a city 50 miles ahead. Arrangements are made by Teletypewriter to release space originally reserved for another city, where the day's demand proves lighter. . . .

An important express shipment is carried on the 4 o'clock plane. It is essential that it be delivered to the consignee immediately upon arrival. A Teletypewriter message explains all details. . . .

Teletypewriters provide the swift, written communication between airports that is so necessary in the successful operation of air lines. A message typed on one machine is instantaneously reproduced at the same moment by all connected machines. The typewritten records guard against mistakes.

This continuous, two-way contact helps to maintain the accuracy of schedules. It is an ideal medium for sending executive instructions; passenger lists; traffic details; accounting matters; freight information.

Teletypewriter Service is now used by the following manufacturing and operating companies: Department of Commerce (Airways Division), Transcontinental-Western Air, Thompson Products, Century Airlines, Lindbergh Line, Eastern Air Transport.

Your local Bell telephone company will gladly give you complete information about Teletypewriters.

THE NEW TELETYPEWRITER SERVICE



The newly announced Teletypewriter Service permits any subscriber to let its typewriter be used instantly to any other subscriber, whether he be around the corner or across the continent. This service differs from private line Teletypewriter Service, also described on this page, in that our subscribers may ask for any other subscriber and be connected immediately by the teletypewriter "circuit."



TELETYPEWRITER SERVICE

YOU BET THEY LIKE

Every landing under Lucas on WILLIAM and his acrobatic plane. His Cessna Hawk has Airwheels.

It's natural Air Tour isn't complete without AIRWHEELS. Note Airwheels on the Bellanca Airbus.



Anyone who knows aviation knows the names shown here. They represent the veterans of speed, of distance, and of long distance flights over land and water.

And mark this fact, every one of these men uses Goodyear Airwheels.

The fact is, no other landing equipment offers such safety under all ground conditions — nothing else approaches Airwheel safety for emergency landings on plowed ground, swamp land, sand or snow.

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Specify Goodyear Airwheels**

GOOD

AIRWHEELS!

OLD BRICK, of Detroit-to-Tulsa feat inside his Fieseler. That's why most that Aviation



Bo's Airwheel aviation was there it was a baby. It's why ALLIANCE and Air Traveler use Airwheels.



For major Airwheels on all major fields as a rule. The photo! First, the Airwheels.



Reports from passenger transport operations show that these big, soft, rolling rubber cushions make a real reduction in maintenance costs — and tests will show that nothing else gives more, smoother control over braking.

If you think these are strong claims, just ask Goodyear to prove them. For complete engineering data, specifications and recommendations for equipping your ships, write or wire to Aeronautics Department, Goodyear, Akron, Ohio, or Los Angeles, California.

**Everything in Rubber
for the Airplane**

YEAR

Look to electric instruments for performance at low cost



This plane is completely equipped with General Electric instruments, control cables, wing edge lighting, and a G-E supercharger.



CONSIDER, for example, General Electric instruments for indicating oil pressure and temperature. They are connected to the engine bearings by electric wires, and they require no tubing or other mechanical connections. This advantage is also characteristic of the G-E engine-temperature indicator and the G-E tachometer. In fact, it is one important reason why electric instruments cost less to maintain.

The panel illustrated is the most completely electrified aircraft instrument panel ever assembled by any manufacturer. All of the engine instruments, the magneto compass, the turn indicator, and even the sonic altimeter are electrically operated. We invite your interest in this thoroughly modern equipment. Address General Electric Company, Aeronautics Section, Schenectady, N. Y.

Key to numbered General Electric instruments shown above

1. Oil-pressure indicator
2. Oil-temperature indicator
- 3 & 4. Engine-temperature indicator (diameter 1 1/2 inch type) and relative switch for 9 cylinders
5. Electric tachometer
6. Electric crankshaft position and flame
7. Voltmeter
8. Magneto-compass indicator
9. Electric turn indicator
10. Sonic altimeter indicator
11. Magneto coil ammeter
12. Compass sensitivity controller
13. Turbulence controller
14. Magneto-compass controller



110-13

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Every night, a thousand American airports are lost in the dark; they have no airport-lighting equipment of any kind. Yet, in many cases, the installation of a General Electric beacon would practically double the accessibility — the usefulness — of an unlighted airport. A beacon is the first essential in order to put an airport on the night map of America.

General Electric offers you a complete airport-lighting service that begins with the planning of installation and continues through years of satisfactory operation. Whether your requirement is a beacon or a complete airport-lighting system, we shall be glad to serve you. Ask for descriptive literature. Address General Electric Company, Schenectady, N. Y., or the nearest house of General Electric Supply Corporation.



Department of Commerce type, 25-watt rotating beacon



Electric coil beacon used to supplement rotating beacons



General Electric glass-front type, 25-watt, rotating beacon



110-13

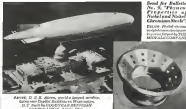
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NICKEL STEEL FORGINGS STAND THE GAFF

NOSE ASSEMBLY OF U. S. S. AKRON WITHSTANDS AB- NORMAL STRESSES IN SERVICE

SINCE the world's largest airship was put into operation by the Navy, it has been subjected on several occasions to abnormally severe service conditions, involving stresses of unforeseen intensity. These conditions constituted a grueling test for the Nickel Alloy Steel mooring cone and accessory parts, yet they stood up perfectly.

The material used is Nickel-chrome-molybdenum steel of 2% to 3% Nickel content) was chosen by the Navy Department and by



ABOVE: U. S. S. Akron, world's largest airship. Below: mooring cone assembly from nose of Akron. D. C. Steel by FUSITECH REFLECTOR COMPANY, CHICAGO, ILLINOIS, U.S.A.

Goodyear-Zeppelin Corporation, the builders of the "Akron", after careful study of the available materials. The forgings were supplied by The Molybde Company, and the test bars showed the following average results:

Tensile strength 152,250 p.s.i.
Yield Point 118,500 p.s.i.
Elongation in 2" 48%
Reduction of Area 94.7%

Further evidence of the use of the

most carefully chosen materials in the Akron is found in the fact that the eight Maybach engines—similar to those used on the Graf Zeppelin, Los Angeles and other large airships—have Nickel Alloy Steel crankshafts and connecting rods. The outboard gears driving the propeller are also made of the same tough, dependable material.

Our technical files contain a wealth of data compiled from the experience of users of Nickel Steels in the aviation industry. You are invited to communicate with our staff of engineers regarding special types of Nickel Steels suitable for your requirements.

Nickel Steel Parts in Akron

Mooring cone

Spindle

Mooring cone bolts

Outrigger gears

Maybach engine crankshafts and connecting rods



ABOVE: Nickel Alloy Steel bolts for mooring cone of U. S. S. Akron. Manufactured by FUSITECH REFLECTOR COMPANY, CHICAGO, ILLINOIS, U.S.A.

Good for Beliefs
Dr. H. "Physical
Properties of
Nickel and Nickel-
Chromium Steels".
Editor: Nickel-chrome
steel is a new development
in aviation. It is the only
material that can stand
up to the stresses of
the Akron.

Exacting Tests insure the Safety of Roebling Control Cord

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In rigging controls with Roebling Control Cord you provide predetermined quality, known stamina and safety of the highest degree. Roebling exercises almost unbelievable care to insure dependability of this important item of plane equipment. Even before the cord is formed, exacting tests are begun. Each wire is gauged several times, and subjected to a series of twisting and kinking tests. Then the completed cord is put through severe bending, proof-loading and tensile strength tests.

Every Roebling Wire Aircraft Product is made with similar painstaking care. You can have complete confidence in any product which bears the name ROEBLING.

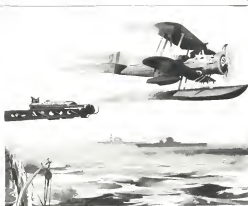
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To win the approval of the U. S. Navy for observation work with the Battle and Scouting Fleets, an airplane must have speed, climb and maneuverability well beyond the current requirements of seaplanes. Dependability and stamina are as basically necessary as engine and engineage. Flights this vast on catapult and end in the least drag are convincing tests of quality in design and structure. Because each of the series of new "Corsair" designs has passed all of these tests by generous margins, the Vought "Corsair" has long been the observation plane used on the Navy battleships and scout cruisers. Chance Vought Corporation, East Hartford, Connecticut, Division of United Aircraft & Transport Corporation. Sole Export Representative: United Aircraft Exports, Inc., 220 Park Avenue, New York, U. S. A.

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NEW MODELS
PRATT & WHITNEY ENGINES
HIGHER H. P. RATINGS



This announces a complete series of new Pratt & Whitney engines, all carrying substantially increased horse-power ratings. All of these improved models are of the nine cylinder, single row, radial type. Built to meet the demand for increased aircraft performance, they embody basic Pratt & Whitney principles responsible for the phenomenal reliability of Wasp and Hornet. Aerodynamic efficiency and improvements will find in these new engines increased power for high performance designs characterizing the most advanced airplane concepts of today. Specific information on these newly developed higher rated engines will be furnished promptly upon request.

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Wasp & Hornet
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ALL ENGINE ... and no frills

Exclusively designed for cowlinging, the exposed rocker arms allow a Jacobs to be serviced more easily and quickly with cowling in place than the ordinary engine without cowling.

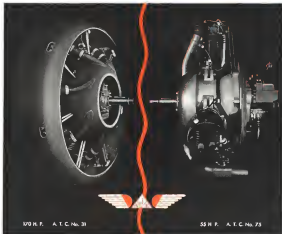
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CENTRAL AIRPORT
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The Jacobs engine is simplicity itself. By concentrating on fundamentals and eliminating non-essentials Jacobs provides more ready accessibility and greater reliability. And simplicity keeps the price down. That's why Jacobs Engines offer outstanding performance at a reasonable first cost and with remarkably low maintenance costs.

JACOBS

AIRCRAFT ENGINE



Master
of
"Blue Sky
Land"

The
GREAT LAKES
Sport
Trainer
FOR 1932



COMMANDING, more than ever, the appraising attention of those who are serious minded about aviation. Providing, at less than \$3,000, a proven ship that is trustworthy for all manner of cross country flights, yet unsurpassed in its suitability for training and instruction purposes.

Use your own sense of values when you consider the Great Lakes Sport Trainer. For here is stability that you can depend upon. A plane that is both fast and maneuverable. Its responsiveness is a delight to everyone who flies. And the beauty of its streamlining bespeaks the master ship that it is... no wonder Great Lakes owners are so proud of the planes they fly!

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Contractors to the United States

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SEE THE
OUTSTANDING
GREAT LAKES
EXHIBIT AT
THE DETROIT
SHOW



Have You
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Your 1932
STANAVO PILOT'S HANDBOOK?

The current edition of this convenient pocket-reference book is now being distributed. The original Handbook was published in 1929 as part of the broad Stanavo program of co-living in the advancement of aviation, and each of the three subsequent revised editions has been received with growing interest and enthusiasm by American pilots.

The 1932 Handbook includes data which pilots

themselves have suggested in addition to information and data generously supplied by members of the aviation industry and by the Department of Commerce, Aeronautics Branch.

Copies are now being mailed to the best available list of licensed pilots. If for any reason you do not receive yours, the attached coupon is for your convenience.

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MORE PILOTS - - DEMAND BIRD SAFETY

INTRODUCED to the air fraternity in 1923 with the highest rating among conventional entries in the Coddington Safe Plane Competition—in production now only three years—the Bird airplane in 1931 won second place in total sales in the biplane open cockpit class and actually led all manufacturers of planes in that group in the fourth quarter of 1931.

Now recognized as the preeminent safe airplane for training—with a performance and economy record which has made it the choice of many of the country's leading amateur and professional pilots, the Bird in 1931 registered—in the face of a severe business depression—a steady gain in popularity and a 16% increase in sales. Truly a significant record when measured by a 25% drop in sales for the industry as a whole.

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Performance, pronounced safety and economy

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SCHEDULES must be maintained and flown safely. It is, therefore, imperative that rugged and dependable flight instruments be provided.

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Catalogue will be sent on request.

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*These important records
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FORMANCE*

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Kendall won 6 out of many prize awards
in all other oils combined at National Air
Races (Cleveland).

Kendall won in World's Long Distance
Non-Stop Flight by Boardman & Polaris
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Kendall Won First Place in Ford Reliability
Test TOURTH Continuous Year.

1936

64.2% of All Race Winners at National
Air Races (Cleveland) used Kendall Oil.

1937

80% of All Race Winners at National Air
Races at Cleveland used Kendall Oil.

1939

In New York to Los Angeles Derby over
6000 of those who finished in all classes
used Kendall Oil.

In the Los Angeles to Cleveland Derby—
all finishers in Class A used Kendall Oil.

*... and 30 hours flying
between drains prove
KENDALL ECONOMY*

KENDALL
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And Kendall economy is just as remarkable—
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Made from Bradford Grade of Pennsylvania
Crude, the finest in the world... specially refined
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You can get Kendall at all principal airports.

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**BUILT TO MATCH THE
INDUSTRY'S FINEST!**



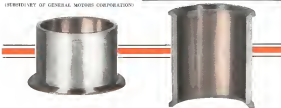
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engineering skill, metallurgy research
and precision production of the builders
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ALLISON STEEL BACK BRONZE
LINED BEARINGS relieve the engine
builder of bearing problems. They assure
the pilot that comfortable freedom from
bearing worries, so important under the
severe conditions imposed by today's
demands.

May we help solve your bearing problems
as we already have done for the builders
of many of the world's most powerful and
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58 Fafnirs

help to Control

this swift Boeing Monomail



SPEED with a heavy pay load are two important characteristics of this new Boeing monomail. Smoother control is another and very important quality which has been attained through the use of 58



Fafnir Ball Bearings in the control mechanism.

Hand-in-hand with this smoother functioning is the characteristic of easily servicing, an inherent quality of friction-free and wear-resisting Fafnirs. And in addition, the saving in space and in weight made possible by these ball bearings are features not to be discounted.

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THE FAFNIR BEARING COMPANY,
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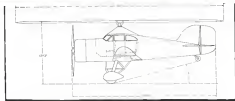
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No. 3, experimental machine 70 feet span and 1200 lbs. gross.

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Continuation pastures and mail take plane. Useful load 1500 lbs., 400 horsepower motor

Announcement:

The Pennsylvania Aircraft Syndicate, Ltd. announces the issue of a basic patent on the rigid feathering "Gyroplane". The Gyroplane is a rotary wing aircraft which differs in principle from all other types, and has many advantages in performance, control, and cost of production.

The Gyroplane has been proven in flight. An Improved and Different Rotating Air Foil System.

Advantages of the Willford Gyroplane:

1. Rigid Feathering blades are used.

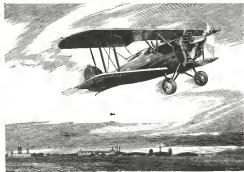
2. High lift airfoils effect small span of rotor.
3. Control in rotor for difficult descents.
4. Minimum parasite drag in cantilever blades.
5. Relation between maximum lift and minimum drag compares with modern wings.
6. Simplicity of structure means low cost of production and maintenance.
7. Smooth in flight.

Write for research information or rights in main factory under the name R. & K. German Patent, which fully protect the rigid system.

PENNSYLVANIA AIRCRAFT SYND. LTD.

WILFORD BLDG., PHILADELPHIA

OIL FAILURE Steals Power— Shortens Motor Life! How to End It . . .



FREQUENT overhauls, worn and scored parts, loss of power—blame them all on oil failure! When ordinary oil breaks down under heat and speed, up goes cost per air mile.

Tough-film Pennzoid—the oil that combats oil failure—increases the mileage on all moving parts, increases the period between overhauls, and insures longer motor life. And because it forms a tough film that resists heat, it gives many extra hours between refills—costs less per air mile.



Pennzoil is a Pennzoid brand name.

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Executive Office: Oil City, Pa.; Los Angeles, Cal.
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Pennzoid is made by the famous Pennzoid Process from 100% pure
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RADIO: Enjoy The Pennzoil Family every Sunday
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The nation's air routes are
"Scintilla equipped," every
mile. Day in, day out,
passengers and mail are
transported by planes
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DEPENDABILITY SIMPLICITY ACCESSIBILITY

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SAFETY FIRST ASSURED—when your radio, lighting and various devices depend on this reliable Exide Aircraft Battery.

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AIR transport is more than twice as safe today as it was five years ago.* Largely responsible for this encouraging progress is the development of radio and, with it, instrument flying.

By making radio communication between plane and station more certain than ever, Exide Aircraft Batteries have contributed materially to flying safety. They are stored and expressed on most of the large airlines.

This battery, safe and dependable beyond a doubt, is designed especially for aircraft service. It's

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Find out why so many of your flying friends favor Exide. A postcard to us today will bring you full particulars by return mail.

*Bureau shows that in 1927 there was one landing for about every two million passenger miles. By the second half of 1931 this record had risen to one landing to about 43 million miles.

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With the acquisition of the Aircraft Products Corporation, Warner now produces along with the well-known Warner "Scarab" Engines a complete new line of aircraft parts.

Warner's plant facilities are comparable to any in the engine industry. The consolidation of the two companies therefore makes an ideal set-up from the standpoint of both production and sales.

In addition to the V Cylinder, 200 H. P., and the 8 Cylinder, 90 H. P., Warner "Scarab" Engines, we are now in a position to furnish to the industry the following products:

Airplane Wheels and Brakes; Axles and complete Under Carriages; Oldsmobile Shock Struts, Tail Wheel Assemblies, Airplane Skis, Porticoes, Flying Boat Hulls and Wing Tip Floats.

Reflected in all of these various products is the experience gained in engine building practice. Precision workmanship of a high order enters into every phase of Warner construction.

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We will welcome your inquiries.

WARNER AIRCRAFT CORPORATION
DETROIT, MICHIGAN



WARNER "Scarab" ENGINES



Standard Features

Greatly increased speed...
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greater safety... more
inherently stable than any
previous Stinson... larger,
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pumps or fender pumps
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receptacles, seat caddies...
dual wheel controls... speed
cutting ring on motor...
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hour of 1000 revolutions...
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3 inches... length, overall,
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Delivered other than standard, extra

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There is no mystery about how to measure the value of an airplane. The same common sense rules that apply in measuring other products are applicable to airplanes. Careful analysis proves that the ideal airplane is the one which offers the greatest degree of Safety, Economy, Stability, Speed, Comfort, and Beauty at the lowest first cost and thereafter at the lowest cost per mile. Stinson does not offer one advantage at the expense of others but is designed and built to be the best COMBINATION of ALL the factors that constitute airplane value. Regardless of price, we believe the new Stinson Model R offers the best combination of all the vital qualities that has ever been

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If you are considering the purchase of an airplane, won't you write or wire us today so that we may present the Model R for your inspection!

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MONUMENTAL

An airplane equipped with Bendix Wheels and Brakes is a safer plane.

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Building Benny Model in engine



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**15 years
of specialization & leadership!**

In 1917, the Haskelite Manufacturing Corporation was organized for the purpose of supplying aircraft plywood to the United States and her allies. At that time we were the only manufacturer specializing in aircraft plywood.

Today, fifteen years later, there are as many as 57 varieties of plywood used in aircraft, but there is only one quality plywood—there can be but one leader—that plywood is HASKELITE. There is still only one company specializing in aircraft plywood—we are that company.

In a national emergency the entire plant of the Haskelite Manufacturing Corporation would be available for the production of aircraft plywood. In such an emergency, our daily capacity could be stepped up to 150,000 square feet per day. No other manufacturer has such a potential production of aircraft plywood.

Since the World War and the days of the "Whistling Benny" we have had faith in the aircraft industry. We have always supported the industry and all of its activities. Annual, we shall exhibit at the Detroit Aircraft Show. Visit our Booth, Space 97.



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Model R-680

Lycoming nine-cylinder,
radial aircraft engine



A RECORD UNEQUALLED

Since its first installation in 1929, this Lycoming nine-cylinder radial engine has powered more four to ten-passenger cabin planes than all other makes of engines combined.

Consider these evidences of overwhelming preference for aircraft powered by Lycoming:

Of the 351 commercial aircraft engines in the 175 to 225 h. p. class sold during 1934, Lycoming sold 285 or 80%.

At the present time, Lycoming Aircraft Engines are being flown upwards of 75,000 miles daily (more than 5 times around the world) 27,000,000 miles per year on air lines in this

country. Recently one company flew 3,000,000 engine miles without an engine failure, using Lycoming engines.

Today more than 40% of the average daily air passenger traffic is carried in Lycoming-powered planes.

There are more, modern four-passenger cabin planes (powered by Lycoming) in use than all others combined.

The U. S. Army Air Corps recently selected Lycomings for their training planes because of their performance, dependability and long life.

Write for literature and detailed information.

Lycoming Aircraft Motors will be exhibited at the National Aircraft Show, Detroit, April 2 to 10

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**For Dependability
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Just as millions of motorists have come to know they can depend on the Willard battery in their cars... so on the network of air lines that covers the nation, Willard Aircraft Batteries have won the confidence of operators and pilots everywhere. • • • Whenever you need a dependable aircraft battery... specify Willard.

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AVIATION'S FIRST *free wheeling* ENGINE

THE GUIBERSON *Aero-* Diesel

Ground-Approved Type Certificate No. 70 by U. S. Department of Commerce in February, 1932... Featured after extensive research and experiment... Backed by a grand old name among manufacturers of equipment for the Oil Industry... Manufacture in commercial quantities soon to begin.

OUTSTANDING FEATURES: 1. One-shaft control, automatically synchronizing timing and fuel injection. 2. Complete decompression allowing "free wheeling" of propeller with engine dead. No driving to restart motor. 3. Operation at fuel cost of one cent per mile. 4. Elimination of free lances. 5. No radio interference. 6. Simplicity.

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GUIBERSON

Aero- Diesel

BETTER BY 50% THAN 50HP





AT LAST!

**A high-performing cabin amphibian
for less than \$10,000**

THE 1932 PRIVATEER III



SPECIFICATIONS

Top Speed 120 m.p.h.
Cruising Speed 100 m.p.h.
Span 42' 6"
Length 32'
Height, on ground 17' 7"
Power Continental
E-670 215 h.p.
New type Torque Ring, Heywood Injection Starter, Low Pressure Tires, Fuel Level Gauge, Tachometer, Oil Thermometer, Altimeter, Air Speed Indicator, Compass, Tools, Anchor, Rope, Life Raft, etc.

AMPHIBIONS, INC., scope the 1932 market . . . producing the first high-speed cabin amphibian selling for less than \$10,000. Creatively speaking, the new PRIVATEER III will outperform any other single-engine amphibian in the country. Powered with Continental's latest—the 215 h.p. E-670—it does 120 m.p.h. And in appearance—it's a beauty. If the business man, sportsman, flying school and commercial operator will find this up-to-the-minute three-place cabin amphibian made to order for his particular use. Aerodynamically it reflects the pioneering work of Amphibians, Inc., in the field of land-and-water aircraft. If utility is supplemented by comfort throughout, the well-appointed cabin seats three with ample head and leg room. The cabin is sound-proofed and equipped with adjustable ventilators, sliding windows, windshield wipers, dust controls, etc. A novel door arrangement provides easy entrance and exit from either side. If the PRIVATEER III will appeal to the individual-minded, for instance, the simplified and automatic positive-action landing gear retraction, the non-corrosive hull structure, fabric covered, the new wing tip floats with shock absorber equipment, the isolated engine mount, The unusual visibility obtained by placing the pilot before the leading edge of the wing. If designed to meet a real demand, dealers will recognize the sales possibilities of this most modern of all cabin amphibians.

Be sure to see it at the Detroit Show—Stands 4, 6 and 8—Western Airways

AMPHIBIONS, INC.
GARDEN CITY LONG ISLAND, N. Y.

"Believe It Or Not—

When Commercial Aviation Standardizes Its Schedules
to Railroad Accuracy, Pilots Will Carry 16-Size Railroad
Watches—And Ten Chances to One Their Choice Will Be

the New

ELINVAR 992 HAMILTON



"Then, and then only," continued a high railroad official who is intensely interested in air passenger transportation, "will the pilot be able to enjoy the maximum safety from the carelessness and telephone systems that now keep flight pilots on schedule and on track with ground operations along the route."

When American railroads were in their infancy, timetables were so complicated that it took a C. P. A. to figure them out. Each community had its own time table and trains were had to be adjusted to the time used in the facilities through which they passed. This transportation problem led to the establishment of our present time standard time belts in the United States.

The new time belts made it easy to lay out train schedules on paper—but still, travel by rail was an uncertain and dangerous undertaking. Many fatal wrecks occurred because timetables looked accurate and dependably accurate with which to carry out their orders and follow time schedules.

But the developing railroad industry met this emergency by adopting standard specifications for the watches carried by train men. They specified a sixteen size, 21 jewel, lever set American watch that would keep time with a maximum variation of thirty seconds a week. A system of time comparison was established and official watch inspectors were appointed by the railroads to see that the watches were kept up to standard. Watches that failed to pass inspection were condemned—and the employee either got a new watch or the railroad got a new employee. Railroad men were rewarded, under penalty of dismissal, not to change the setting of their watch between inspections. Their duty was to wind their watches daily and have them cleaned and oiled when ordered to do so by the inspector.

Then came Hamilton—a watch designed to meet railroad specifications. It was immediate performance and its reputation as the Watch of Railroad Accuracy is based on performance through forty years of railroad service.

Now we present a watch for modern transportation—the Hamilton 992 Elivar—the only watch which successfully meets inspection and remains unaffected by sudden temperature changes. No other watch can give the day keeping because it is made of a synthetic wire that gives alloy known as Elivar. The Hamilton Watch Co. has only American rights for the use of Elivar in precision instruments.

We firmly believe that aviation will soon realize the value of a time instrument service—adopting railroad standards for watches to be carried by the crew of aerial transport. Such a service means added safety—certain schedules which will encourage the use and development of an industry destined to become a major medium of transportation in America.

Let us send you our booklet about the Hamilton 992 Elivar. You'll be surprised to learn how closely this watch will meet your time requirements. Write for a copy of "Elivar in Your Watch." Address, Department A, Hamilton Watch Co., Lancaster, Penna.



★ ★ ★ ★

HAMILTON
The Watch of Railroad Accuracy



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proved by millions of flying miles

SRB Aviation Ball Bearings are used more extensively in aircraft engine service than any other make. Such manufacturers as Continental, Curtiss, Jacobs, LeBlond, Lycoming, Pratt & Whitney, Warner and Wright are users of SRB Ball Bearings. This performance is due to their inherent quality as demonstrated through millions of miles of dependable flying service.

The SRB design includes deep grooves in the raceways conforming closely to the ball contour. It contains the maximum number of largest possible balls consistent with structural strength of the races. Balls are hot forged from Molybdenum Steel. Ball retainers are of the riveted stay-and-type. This combination of features not found in any other ball bearing gives the absolute maximum in radial and thrust capacity and durability.

SRB Engineers with their years of experience in the Aircraft Industry are available for consultation on your bearing problems.

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DIVISION OF MURPHY-BROWN-DESS CORPORATION
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Full type ball
construction
without cover
One side shielded



**SRB
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WATER BALL
BEARINGS**
Exceptionally
high capacity—
rating 15,000 to
20,000 lbs weight.



**SRB-A
SUPER-LIGHT
BALL BEARINGS**
With Farness separator
for high speed operation.



**SRB
MAXIMUM CAPACITY
SINGLE-ROW**
The greatest radial capacity which can be incorporated into a single-row bearing of well-balanced design.



Photo by F. J. B. & Co., Inc., New York

Linking the Americas

HIGH above the Hudson's waters, the flagship of Pan American Airways circles in final salute to Gotham as she noses toward the Caribbean.

This 45 passenger Sikorsky is the largest amphibian in the world. Linking the Americas is her regular job. And since her maiden voyage with Col Lindbergh at the controls, she has performed it dependably, trip after trip.

Every flight the American Clipper makes is a Stromberg responsibility. Four Stromberg Carburetors supply the fuel mixture for her engines—2300

horsepower total. An outstanding example of Stromberg dependability contributing to Pan American dependability.

The American Clipper is but one of many Pan American planes—all types—that depend on Stromberg Carburetors. In fact, 95% of the planes flying in the United States today are Stromberg-equipped.

If you have a carburetion problem, let us know. Our engineers would like to cooperate. There is a Stromberg Carburetor for every type and size of plane.



Stromberg 150-100 Carburetor double throat type. Weight 11 pounds. Fuel/air mixture 15:1 to 20:1. Capacity 1500 to 2000 C.F.M.

There are four of these carburetors on the ship shown in the photograph

STROMBERG CARBURETORS

BENDIX STROMBERG CARBURETOR COMPANY

A DIVISION OF BENDIX AVIATION CORPORATION

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Ball Bearings





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Martin Military Airplanes—the product of advanced engineering, coupled with progressive shop methods and thorough laboratory testing of all materials.



Basic, easy power design and smart safety. The above photograph shows a section of work being done on a turbine engine. All other parts are as carefully tested.



Shown: The Martin Process Laboratory, equipped with the most modern testing equipment available, carefully checks for quality and strength of materials used in Martin planes.

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Consistent in Martin all metal airplanes is inclusion of a complete line of materials of excellent research in Martin Engineering. The equipment shown above is "standard" in the industry and is used in the most exacting tests.

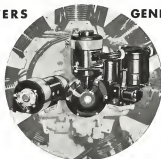


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Delco Aviation Ignition Unit



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Eclipse Aviation Starter
Eclipse Aviation Starter, Type E-150, for engines up to 400 cc. in piston displacement.

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Manufactured by
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ECLIPSE
STARTERS - GENERATORS

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Pan American Airways—The Maritime Marine of the Air—covers 50,000 miles of airway and links five-continent countries and colonies of the Western Hemisphere to the United States. This encompasses 13,000 aerial miles of over-ocean flying, 600 of which connect-way across the Caribbean Sea.



The American Clipper arrives at Havana harbor after four-day flight.

Pan American has an "on-time" arrival record of 99.62%

The HQ multi-storied, radio equipped, passenger, mail and express airliners in the Pan American Fleet serve ninety-four airports and seaplane bases. There are fifty-six private ground radio and weather stations. To date, operations cover 29,000,000 passenger miles flown; 104,000 passengers carried; 5,380,000 pounds of air mail and cargo transported with an "on time" arrival record of 99.62%.

The flagships of the fleet are the giant Sikorsky S-50's, American Clipper and Caribbean Clipper. These are the largest ships of the kind in regular service on any air line. They carry forty-five passengers and a crew of five. Each ship is powered by four Pratt & Whitney Hornet engines.

Pan American covers one of the most interesting airways in the world. Its ships are called upon to do almost unimagineable things. They must fly from water level to more than mountain heights. They must tap the Andes and undergo a temperature change of from 90° above to 30° below zero—120 degrees—in one hour. In all flying operations perfect spark plug performance is vital—that's why Pan American uses B. G. Mott Aviation Spark Plugs.



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GUIDED by the records of 2,080,634 miles flown in transporting 87,520 passengers on a schedule of twelve round trips daily, and convinced by seventeen months' contact with the men and women who fly regularly and frequently between New York, Philadelphia, and Washington—the Ludington Airlines, Inc., chose 1932 model FLEETSTERS... because they fulfill the demands of air travelers for comfort and convenience... because they afford lower maintenance and operation costs... and because they carry nine passengers and more than 400 pounds of baggage at a cruising speed of 140 miles an hour.



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instruction; there has never been a better working in the 5 months the "Cub" has been on the market.

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Boeing graduates outnumber those of other schools operating today in the extent of their employment by important air lines and manufacturers. To become a Boeing graduate means that the highest standards of commercial training developed in America have been successfully met.

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On your way to the Show stop at our hangar. We maintain parts depots and service facilities at Detroit, Cleveland, Pontiac, Chicago, Kalamazoo, South Bend and Bay City, with completely equipped repair shops at Cleveland and Pontiac. And on major overhaul jobs we go anywhere. Ask us for full particulars.



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This fast-flying, fast-diving Army pursuit ship was the first standard high-powered water-cooled model built in the United States. Because it embodied the famous Boeing stamina and anticipated a number of future developments, several are still in service — another instance of Boeing construction years ahead of its time. Boeing Airplane Company, Seattle, Subsidiary United Aircraft & Transport Corporation.

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has always built
to-morrow's airplanes
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